

# CONFERENCE PROCEEDINGS

ON

*Transforming Information and Library Education  
and Profession for the Next*

**(7<sup>th</sup> I-LISS International Conference)**

20<sup>th</sup> - 21<sup>st</sup> July 2023

**Jointly Organized By:**

Department of Information Science, Khon Kaen University, Thailand

The International Library and Information Science Society (I-LISS)

Korea Institute of Science and The Technology Information (KISTI)



*Transforming Information and Library Education  
and Profession for the Next*

**Proceedings of 7<sup>th</sup> I-LISS International  
Conference 2023**

**Jointly Organized By:**

**Department of Information Science, Khon Kaen University, Thailand  
The International Library and Information Science Society (I-LISS)  
Korea Institute of Science and The Technology Information (KISTI)**

**Sponsored By:**



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# **BIOGRAPHY**



## Dr. Gobinda Chowdhury

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### Professor

Department of Computer & Information  
Sciences, University of Strathclyde, UK

**Gobinda Chowdhury**, BSc. (Hons), MSc., PhD, FCLIP, SFHEA, is a Professor of Information Science in the Department of Computer & Information Sciences at the University of Strathclyde in Glasgow, UK. Previously, he had held several senior academic positions: as a Professor and Head of Mathematics and Information Sciences, and as the Head of iSchool at Northumbria University in Newcastle, UK; and as a Professor and Director of Information and Knowledge Management at the University of Technology Sydney in Australia.

Professor Chowdhury's research focuses on connecting people with information through technology. He is a world leading expert in digital libraries, cultural information management, and sustainable information systems & services. He has published 16 books and over 160 research papers (<https://scholar.google.com/citations?user=qmRMHx0AAAAJ&hl=en>). His early research on digital information systems & services has received global recognition. Subsequently, his research on digital libraries, cultural heritage information management, and sustainable information systems & services has resulted in several world leading publications, keynotes, conference chair positions, invited talks, and so on. He has successfully led and managed a number of research projects funded by the UK AHRC, the US Mellon Foundation, the European Commission, Jisc, UK HEA, and so on. His global reputation as an information scientist has led him to the position of the global Chair of the iSchools organisation ([www.ischools.org](http://www.ischools.org)). His expertise has earned him invitations as a keynote speaker at several international conferences, various academic review boards, and as a consultant in information and knowledge management at global organisations like UN and the IAEA in Vienna.



## Dr. Anne Goulding

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Professor

School of Information Management, Victoria  
University of Wellington, New Zealand

**Anne Goulding** is Professor of Library and Information Management at Victoria University of Wellington, School of Information Management, New Zealand. Her research interests lie primarily in the area of the management of library and information services and her main focus is on the management of public libraries. She has a particular interest in how library and information services demonstrate the impact of their programmes and services. In recent years, Anne has undertaken research into storytime programmes in public libraries and how they contribute to community-based print and digital literacy. She also has an interest in teaching and learning in the information studies field, including the continuing professional development of librarians and information workers.

Anne is Editor of *The Journal of Librarianship and Information Science* which is one of the foremost journals in the librarianship field. She has published widely in refereed journals and edited works and has given conference presentations on the topic of public library services.



## Dr. Dong-Geun Oh

### Professor

Dept. of Library & Information Science,  
Keimyung University, Korea

#### Work experience

- President of I-LISS
- Professor, Dept. of Library & Information Science, Keimyung University, KOREA
- Director, School of Library and Information Service, Keimyung University
- President, Library and Information Science Society for Asia and the Pacific
- President 2016-2017, Korean Library and Information Science Society
- Editor-in-Chief, JISTaP, Journal of Information Science Theory and Practice

#### Education

- BA in Business Administration, Korea National Open University, South Korea. 1993
- BA in English Language & Literature, Chung-Ang University, South Korea. 1984
- BS in Computer Science, Korea National Open University, South Korea. 1991
- Master in Business Administration (Marketing), Kyung-Pook National University, South Korea. 2001
- Master in Library & Information Science, Chung-Ang University, South Korea. 1986
- Doctor of Philosophy in Library & Information Science, Chung-Ang University, South Korea. 1991

#### Achievements/Awards

- Academy Award 2009 (Korean Library and Information Science Society)
- Best Research Award 2002 (Keimyung University)
- Bisa Best Research Professor (Keimyung University), selected 6 times
- Distinguished Achievement Award 2012 (Keimyung University)
- Distinguished Industry-University Cooperative Research Award 2013 (Keimyung University)
- Distinguished Industry-University Cooperative Research Award 2016 (Keimyung University)
- Korean Library Award 2001 (Korean Library Association)
- SRFLIS Award for Professional Excellence 2016: World Library Leaders (Satija Research Foundation for Library and Information Science, India)



## Dr. Kulthida Tuamsuk

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### Professor

Department of Information Science,  
Director of Smart Learning Innovation  
Research Center, Khon Kaen University

**Dr. Kulthida Tuamsuk** is a Professor and Senior Researcher at the Department of Information Science, Faculty of Humanities and Social Sciences at Khon Kaen University. She is also the Director of the Smart Learning Innovation Research Center. With a Doctor of Arts degree in Library and Information Science from Simmons College, USA, earned in 1995, Dr. Tuamsuk's expertise lies in Digital Humanities, Information Science, and Smart Education. She has made significant contributions to the field and has been recognized with numerous national and international awards. Notably, she has received the First International GSLIS Alumni Outstanding Achievement Award, Best Paper Award, WCU Enforcement Award for Teaching and Learning Development and Design, PULINET Award, etc. Throughout her career, Dr. Kulthida Tuamsuk has held many important positions. She has served as the Deputy Chairperson of Burapha University Council and holds an Honorary Membership on the University Council at Nakhon Phanom University. She has been invited as a keynote speaker at prestigious conferences and is an active member of various international organizations and consortiums. She has chaired and been part of organizing committees for notable international conferences and serves as a peer reviewer for respected international journals. In addition, her expertise is sought after for evaluating educational programs and journal articles. Dr. Kulthida Tuamsuk's remarkable accomplishments and contributions have solidified her position as a leading figure in the field of information science and smart education.



## Dr. B. Ramesh Babu

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Professor

Department of Library and Information  
Science, University of Madras

**Dr. B. Ramesh Babu** was *Professor* in the Department of Library and Information Science, University of Madras and former Visiting Professor at the **Mahasarakham University, Thailand**. He served in **State Regional Library in Andhra Pradesh (1979-80)** and **Ramakrishna Mission Vivekananda College Library, Chennai (1980-90)** before joining in the University of Madras as faculty from where he superannuated. He has been awarded **Dr. S.R. Ranganathan Memorial Gold Medal** by the University of Mysore. Awarded **Commonwealth Fellowship (UK) Commonwealth for Post-Doctoral research for the year 1999/2000** and worked on “**Web OPACs in the UK Academic Libraries**” at the **Department of Information Science, Loughborough University, United Kingdom** and visited France, United Kingdom, Nepal, Muscat, Thailand, Laos, Bangladesh, Germany and South Korea on academic invitation. He has been awarded **C. D. Sharma Best Paper Award** by the Indian Library Association, **Prof. Parvathaneni Gangadhara Rao Memorial Award** by the Potti Sreeramulu Telugu University, Hyderabad, **IATLIS-MOTIWALE Best LIS Teacher Award** by IATLIS, **Best Reviewer award** by **Korean Institute of Science and Technology Information, South Korea**, **Lifetime Achievement Awards** by the **Karnataka State SC & ST Library Professionals Association**, and **Madras Library Association** and also **Iyyanki Venkataramanayya and Velaga Venkatappiah Library award** was conferred under the auspices of **Prof. Kaula Endowment for Library and Information Science**. He has also been conferred **ILA – Dr PSG Kumar Life Time achievement award** by the **Indian Library Association for the year 2020**. About 30 candidates were awarded Ph. D degree under his guidance. He is serving as **Member of the Editorial Board of 14 National and International Journals** and serving as **referee / reviewer for a number of journals**, both Indian and foreign. He has **completed 5 major projects both National and international**. He has published more than **450 research papers** in Indian and Foreign journals, Festschrift volumes and National and International seminars/workshops on various aspects of Library and Information Science. He has edited about **56 books** including conference proceedings and festschrifts. He has organized and directed a number of workshops, seminars and conferences at national and international levels. He is a **Resource person** in various **Distance Education Institutes** including IGNOU and prepared course materials for **14 universities** and delivered lectures. He has delivered **Guest Lectures** in a number of Universities and Academic Staff Colleges (Human Resource Development Centres) in Andhra Pradesh, Telangana, Tamilnadu, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Pondicherry, Tripura, Assam and Orissa States. He has served as UGC Visiting Fellow of Sambalpur University (One time), Dr. B. R Ambedkar Marathwada University (Four times) and Andhra University (Two times). Currently

he is the Co-President of **I-LISS** and **Life Member** in ILA, IASLIC, I-LISS, IATLIS, MALA, APLA, ALSD and TLA. He has been honoured with two festschrifts, one in four volumes entitled “**Dynamics of Librarianship in the Knowledge Society**”, and one volume of reprints entitled, “**Facets of Librarianship: Yesterday, Today and Tomorrow**”.

## Dr. Ma. Lindie D. Masalinto

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### Professor

University of Perpetual Help System Laguna,  
Philippine

**Dr. Ma. Lindie D. Masalinto**, is a librarian and a professor. Over the past two decades, she has worked in a variety of professional capacities, especially in the private academe. She earned her Master of Education (major in Library Science) at Philippine Normal University, Manila, and graduated with her Doctor of Philosophy major in Educational Management (Ph.D.) at the University of Perpetual Help System-Laguna. Lindie is affiliated with international and national organizations such as the Philippine Association of Medical Journal Editors (PAMJE); Asia Pacific Association of Medical Journal Editors (APAME ); Philippine Association of Teachers in Library Science ( PATLS); Council of Deans and Heads of Library and Information Science Schools in the Philippines ( CODHLIS ); Chairman of House of Delegates and Committee Chair on Research of Philippine Librarians Association, Inc - National Board of Trustees ( PLAI-NBOT ) and currently elected as I-LISS Vice President Philippines (Regional)) chapter. She has published articles in international peer-reviewed journals, and presented several international papers in ( Asia –Pacific in Library Information and Education Practice (ALIEP ); and the Asia Pacific Association of Medical Editors ( APAME). She has been a peer reviewer of local and international journals. Currently, she serves as the Chief Librarian of the University of Perpetual Help- Dr. Jose G. Tamayo Medical University, Binan, Laguna Philippines where she is also an ISO 2015 Internal Auditor and a PACUCOA accreditor.





## Dr. Pimrumpai Premssmit

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### Assistant Professor

Special lecturer, Department of Library Science,  
Faculty of Arts, Chulalongkorn University

**Dr. Pimrumpai Premssmit** received a BA with honors and MA in history from Faculty of Arts, Chulalongkorn University. She was awarded a scholarship to study abroad and received Master of Science and Doctor of Arts in Library and Information Science from Simmons College in Boston, Massachusetts, USA.

She is a special lecturer at the Department of Library Science, Faculty of Arts at Chulalongkorn University. Her past administrative positions include Associate Dean for Academic Affairs (1998-2000) and Associate Dean for Planning and Development (2000- September 2004) of Faculty of Arts and the Director of the Center of Academic Resources (2005-2015), Chulalongkorn University. Her publications include several articles on information management, information systems, library and information science education, strategic planning for academic libraries and digital libraries. Research interest is on leadership in university libraries.

She was the project leader for “The ICT Master Plan for Office of His Majesty’s Principle Private Secretary B.E.2552-2555 (2009-2012)

**Awards** received include the Outstanding LIS professionals in 2014, the Thai Library Association and the Southeast Asian Librarian Award 2018, Congress of Southeast Asian Librarians (CONSAL).

She was a conference co-chair and a program committee co-chair of the 8th International Conference on Asian Digital Libraries (ICADL) held in Bangkok on December 12-15, 2005. She was a program committee of the 9th ICADL held in Tokyo, Japan on November 27-30, 2006. She is also an international steering committee of the ICADL, Co-chair, The 5th International Conference on Asia-Pacific Library and Information Education practice - A-LIEP 2013, Khon Kaen, Thailand, Program Committee, The 6th International Conference on Asia-Pacific Library and Information Education and Practice ASIA-PACIFIC LIS: EXPLORING UNITY AND DIVERSITY Manila, the Philippines. October 28-30.

She was the Chair of the Organizing Committee, the International Forum on Data, Information, and Knowledge for Digital Lives. Bangkok, Thailand, November 13-15, 2017. In 2023, she is invited to be ALIEP 2023 Program Committee.

She was a keynote speaker in International Conference on Information Science – ICIS 2022 on “Leading through disruptions: Rethinking the role of Information Professionals.”

## PREFACE

Information and Library Education and Profession serve as the backbone of knowledge societies, providing essential resources and expertise to individuals and communities. Through education and professional development, this field equips individuals with the skills to locate, evaluate, and utilize information effectively, fostering critical thinking and information literacy. Information and Library Education and Profession also play a crucial role in preserving cultural heritage, promoting intellectual freedom, and advocating for equitable access to information for all. Information and library professionals have always played a pivotal role in connecting people with knowledge and facilitating the free flow of information. However, the digital revolution has unleashed an overwhelming amount of information, making it crucial for information and library professionals to adapt and equip themselves with the necessary skills and tools to navigate this complex landscape.

The 7th I-LISS International Conferences 2023 on “**Transforming Information and Library Education and Profession for the Next**” is organized by Department of Information Science in association with Khon Kaen University, International Library and Information Science Society (I-LISS), KISTI (Korea Institute of Science and Technology Information), Futurenuri, Inc (South Korea), and Gale Company. The conference will be held in the Department of Information Science, Faculty of Humanities and Social Sciences, Khon Kaen University (iSchoolKKU), Thailand on 20–21 July, 2023. This conference serves as a platform for educators, practitioners, researchers, and policymakers to come together and address the pressing issues we currently face in information and library education and profession. It offers an opportunity to engage in fruitful discussions, share innovative ideas, and collaborate on designing transformative strategies that will shape the future of this field.

There are 45 papers have been received from various countries, for example, Thailand, India, Philippines, Japan, South Korea, Sri Lanka, and Vietnam. The contents of the proceeding are divided into three sections:

- Section I. Information and Library Science Education
- Section II. Information and Library Science Research
- Section III. Information and Library Science Practices

The conference features keynote speeches, panel discussions, workshops, and paper presentations, covering a wide range of topics related to information and library education and profession. It is our hope that through this collaborative exchange of ideas, we will identify innovative approaches, best practices, and actionable solutions that will drive positive change in this field.

We would like to extend our heartfelt appreciation to the **International Library and Information Science Society (I-LISS)**, **KISTI (Korea Institute of Science and Technology Information)**, **Futurenuri, Inc. (South Korea)**, and **Gale Company** for their invaluable support and

collaboration in organizing the conference. Your partnership and dedication have been instrumental in making this event a success.

We would like to express our sincere gratitude to **Prof. Dong-Geun Oh**, Professor and Chairman, Keimyung University, South Korea, Editor in Chief of the Journal of Information Science Theory and Practice (JISTaP), and President of I-LISS for his outstanding support and guidance throughout the conference.

We are immensely grateful to the esteemed keynote speakers: **Prof. Gobinda Chowdhury**, Head of iSchool, Department of Computer & Information Sciences, University of Strathclyde, Glasgow, UK; and **Prof. Anne Goulding**, School of Information Management, Victoria University of Wellington, New Zealand for your remarkable contributions as keynote speakers, which have greatly enriched this conference.

Finally, we extend our deepest gratitude to all the session chairs, reviewers, participants, presenters, and organizing committee for their dedication and contributions to this conference.

This conference has brought together experts and practitioners from Information and Library Education and Profession field to share their insights and experiences. We hope that this conference has stimulated new ideas and collaborations among the participants, and that the papers will serve as valuable references for future research and practice.

**Prof. Dr. Kulthida Tuamsuk**

I-LISS 2023 Conference Chair

# **Welcoming Remarks & Introduction to I-LISS**

**for the 7<sup>th</sup> I-LISS International Conference 2023**

**July 20<sup>th</sup>, 2023**

**Khon Kaen University, Thailand**

**By Professor Dr. Dong-Geun Oh**

President of I-LISS

Chair of the Department of Library and Information Science,

Keimyung University, South Korea

**Associate Professor Maitree Inprasitha,**

Vice President for Education and Academic Services, Khon Kaen University, Thailand

**Professor Dr. Kulthida Tuamsuk,**

Chair of the I-LISS 2023 Conference

Senior Researcher, Department of Information Science, Khon Kaen University, Thailand

**Professor Dr. Gobinda Chowdhury,**

Former Chair of iSchools Organization and Head of iSchool, Department of Computer & Information Sciences, University of Strathclyde, UK

**The Presenters and Participants,**

**Distinguished Guests, Ladies and Gentlemen,**

It is a great honor for I-LISS International Conference organizing committee and participants to have Associate Professor Maitree Inprasitha, Vice President for Education and Academic Services, Khon Kaen University, Thailand, Professor Dr. Kulthida Tuamsuk, Chair of the I-LISS 2023 Conference and Senior Researcher, Department of Information Science, Khon Kaen University, Thailand and Professor Dr. Gobinda Chowdhury, Former Chair of iSchools Organization and Head of iSchool, Department of Computer & Information Sciences, University of Strathclyde, UK presents here today at this opening session to welcome all the presenters and participants.

I-LISS or International Library and Information Science Society is one of the International nonprofit organizations representing the interest of Library and Information service professionals and library users. The Society was founded during the 2<sup>nd</sup> International Conference on Innovation Driven Librarianship (2nd ICIDL 2015) held at SRM University on 11-13<sup>th</sup> June 2015, Tamil Nadu, India, proposed by myself (Prof. Dong-Geun Oh), who was acting as the Conference Chair. My ideas were subsequently accepted by the participated country members, and the members agreed to the proposal of starting the Society, head quartering Central Library, SRM University. Since then, it has grown to be the renowned international conference in library and information science with focus on education, research, and practice.

I-LISS, as an international non-government, non-profit organization, aims to contribute for the betterment of Library and Information Science Profession and Education, Training and Research, to facilitate the cooperation and collaboration among the researchers in all areas related to Library and Information Science, mainly based on the close personal relationships and co-operation, to promote the best practices in Library and Information Science among the members and member countries, to conduct Conferences, Seminars and workshops in Library and Information Science and to publish journals,

newsletters and research monographs for the benefit of the members of the Society in tune with the objectives of the Society, as well as to do all such other things as incidental or conducive to the fulfillment of the above mentioned aims and objectives.

On behalf of the conference organizers, I congratulate the Information Science Department (iSchool KKU), Faculty of Humanities and Social Sciences, Khon Kaen University, Thailand, for organizing and hosting this 7<sup>th</sup> I-LISS International Conference 2023.

Finally, I would like to thank all the keynotes, panelists, sponsors, presenters, and participants, especially those who have come from abroad. I hope you will enjoy your visit and welcome you all to 7<sup>th</sup> I-LISS International Conference 2023.

Thank you very much.

# **Welcoming Remark & Reporting Speech**

**for the 7<sup>th</sup> I-LISS International Conference 2023**

**July 20<sup>th</sup>, 2023**

**Khon Kaen University, Thailand**

**By Professor Dr. Kulthida Tuamsuk,**

Chair of the I-LISS 2023 Conference

Senior Researcher, Department of Information Science, Khon Kaen University

**Associate Professor Maitree Inprasitha,**

Vice President for Education and Academic Services, Khon Kaen University, Thailand

**Professor Dr. Dong-Geun Oh**

President of I-LISS and Chair of the Department of Library and Information Science,  
Keimyung University, South Korea

**Professor Dr. Gobinda Chowdhury**

Former Chair of iSchools Organization and Head of iSchool, Department of Computer &  
Information Sciences, University of Strathclyde, UK

**The Keynotes, Presenters and Participants,**

**Distinguished Guests, Ladies and Gentlemen,**

It is a great honor for the 7<sup>th</sup> I-LISS International Conference 2023 organizing committee and participants to have Associate Professor Maitree Inprasitha, Vice President for Education and Academic Services, Khon Kaen University, Professor Dr. Dong-Geun Oh, President of I-LISS and Chair of the Department of Library and Information Science, Keimyung University, South Korea, and Professor Dr. Gobinda Chowdhury, Former Chair of iSchools Organization and Head of iSchool, Department of Computer & Information Sciences, University of Strathclyde, UK, presents here today at this opening session to welcome all the presenters and participants.

From the solid foundation in Library School, Faculty of Sciences and Arts, Khon Kaen University, Thailand, the Department of Information Science (iSchool KCU) was established in 1975. It keeps moving forward in accordance with the advancement to provide competent manpower. The organizations can therefore benefit from greater data, information, and expertise to get a competitive advantage. It was the first academic setting in Thailand to provide information science courses to undergraduate, graduate students (both Master and Doctoral levels). Additionally, it was selected to be the 100<sup>th</sup> member of the iSchool organization, making it the first institution of iSchool in Thailand, widely known as iSchool KCU. Further, it has adapted learning programs to meet standards and fulfill the needs of the business sector, including excellent curriculum, excellent and diverse teachers, excellent and passionate students and excellent industry partnership.

This 7<sup>th</sup> I-LISS International Conference focuses on “**Transforming Information and Library Education and Profession for the Next**” through Hybrid mode and continues to bring about the many changes impacting on Information and Library Education and Profession in the digital transforming environments to be discussed and shared. The two-day conference comprises of two keynotes which will be delivered by prestigious international educators. Three panel sessions on ILS education, research, and practices; I-LISS committee meeting and the concurrent sessions of 45 paper presentations. The

number of participants of this I-LISS 2023 is now exceeded 140 people from 7 countries including South Korea, Japan, India, Sri Lanka, Vietnam, Philippines, and Thailand.

On behalf of the conference organizers, the Information Science Department (iSchool KKU), Faculty of Humanities and Social Sciences, Khon Kaen University, Thailand, I am grateful for the kind contributions from the keynote speakers, the panelists, the authors of the papers, the sponsors, our department members and both undergraduate and graduate students who have made this conference possible. I also thank the participants who have come from different parts of the world to make this conference becoming more worldwide. I welcome you all to 7<sup>th</sup> I-LISS International Conference 2023.

Thank you very much.



# Opening Speech

for the 7<sup>th</sup> I-LISS International Conference 2023

July 20<sup>th</sup>, 2023

Khon Kaen University, Thailand

**By Associate Professor Maitree Inprasitha, Ph.D.**

Vice President for Education and Academic Services, Khon Kaen University

**President of I-LISS, Chair of I-LISS Conference, Keynote speakers, presenters, participants and members of the organizing committee,**

It gives me great pleasure and honor to preside over the opening ceremony of the 7<sup>th</sup> International Conference I-LISS 2023, which is being held today at Khon Kaen University by the Information Science Department of the Faculty of Humanities and Social Sciences (iSchool KKU).

Khon Kaen University (KKU) was established as the major university in the Northeastern part of Thailand in 1964 and has developed itself to become one of the top universities in Thailand and Southeast Asia. KKU has been announced to be one of the nine national research universities in Thailand and an educational hub of the Greater Mekong sub-region. The university's major mission is to prepare future global citizens to work in a continually changing world. At the same time, it places importance on social development and sustainability. Therefore, in the year 2023, KKU is now celebrating its 60<sup>th</sup> anniversary for its recognition as the university with a heart for social devotion. This I-LISS 2023 is one of the highlighting events to celebrate KKU's 60<sup>th</sup> anniversary.

Information is the cornerstone of societal growth and is required to create a knowledge society. It is a component of the creative and development process as well as a factor in the advancement of the economy, society, culture, education, and research. Developed nations are aware of its significance and actively promote information utilization for a country's progress.

Today's information and communication technology is one of the major factors causing changes in the way people communicate, locate, retrieve and use information. In addition to preparing future information professionals, researchers, and scholars for a world that is becoming more and more information-driven. Information and Library Education is committed to understanding the role of information in nature and human endeavors. Information and library education and profession have embraced the new information and communication technology more profoundly than many other fields for the strength and success of a profession.

The 7<sup>th</sup> I-LISS International Conferences 2023 is therefore organized under the theme of "**Transforming Information and Library Education and Profession for the Next**" through Hybrid mode by the Information Science Department (iSchool KKU), Faculty of Humanities and Social Sciences, Khon Kaen University, Thailand, in collaboration with Khon Kaen University, KISTI (Korea Institute of Science and Technology Information), FutureNuri, Inc (South Korea), and Gale Company during July 20–21, 2023, in order to encourage innovation,

augmentation, and utilization of ICT technologies to provide the right information to the right user at the right time in the right way following the COVID-19 pandemic.

Now is an auspicious time. I'd like to welcome everyone to the I-LISS International Conference 2023, and may now declare on the opening of 7<sup>th</sup> I-LISS International Conference 2023.

Thank you to all of the speakers, attendees, and members of the organizing committee. I hope the world meeting today succeeds in all of its goals. I appreciate you very much.

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## **KEYNOTE ABSTRACTS**

# Information and Library Science Education for the Next Generation Professionals and Researchers

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### ABSTRACT

Library and information science (LIS) education and research has always remained a pillar of the modern information and knowledge society. Given the rapid technological, societal and global developments, as well as challenges, the need for appropriate LIS education and training has become ever more important for the future generation of information professionals and researchers. In his keynote address, Professor Gobinda Chowdhury will discuss the three sets of skills that the LIS professionals need to acquire, viz., the core skills, generic skills, and professional skills. While discussing the key elements of each of these three sets of skills, Professional Chowdhury will draw references from some of the recent developments, such as data-driven government, business, health, education, etc., as well as the challenges facing people and society such as the digital divide, misinformation, privacy and data protection, etc. Based on some of his recent and going research activities, Professor Chowdhury will also discuss how the LIS profession can make significant contributions to some global challenges like the climate change and the UN Sustainable Development Goals (SDGs). Overall, the keynote will stimulate critical thinking and discussions about the future of the LIS profession in a fast-changing world, and how the future generation of information professionals should be prepared to face these challenges.



# Supporting Successful Educational Transitions for the Next Generation of ILS Professionals

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## **ABSTRACT**

A tertiary-level qualification, undergraduate or postgraduate, is generally required for those seeking a career in libraries and information services. Those entering ILS programmes will encounter a range of opportunities and challenges as they adjust to studying at a higher level. The importance of a positive transition experience for student retention and future success cannot be over-emphasized. While higher education institutions often provide orientation programs that help students learn about policies, processes and resources, this talk will focus specifically on the affective aspects of education transitions which are often not given as much prominence. Drawing on empirical evidence from a research project investigating the transition experiences of postgraduate distance ILS students, Professor Goulding will discuss how tertiary institutions can emotionally support students as they move to higher-level learning. Bridges' Transition Model will be used to frame the talk because of its focus on the affective processes accompanying change, and evidence indicating that transitions between different levels of learning often provoke strong emotional reactions that can impact learners' successful adaptation to their new learning context. The research identified that ILS students experienced a range of positive and negative emotions when joining their programme, reflecting the stages of Bridges' Transitions Model. While most adjusted and completed their studies successfully, the transition was an uncomfortable and emotionally-demanding experience for some. Professor Goulding will conclude her talk with a discussion of approaches to support a successful transition to ILS programmes.

## **SECTION I**

### **INFORMATION AND LIBRARY SCIENCE EDUCATION**

# **The Role of Academic Libraries and Librarians in The NAAC Accreditation Process: with a Special Reference to The Government Degree Colleges in Andhra Pradesh, India**

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## **ABSTRACT**

This paper discusses the role of Academic libraries and librarian in the process of the National Assessment and Accreditation Council (NAAC) in the light of revised framework. The library plays a major role in catering to the information needs of educational community. They play a significant role in lead the Higher Education institutions. The quality indicators framed for libraries in the NAAC accreditation process have provided guidelines for improving the quality of the libraries. The whole process is user centric and provisions and management of the services and facilities and its usage gives a good score. It indicates the college libraries such as quality identified utilization of library services. Management, ICT, best practices Assessment and Accreditation through National Assessment and Accreditation Council (NAAC) is now obligatory to all the higher education institutions. In September, 1994, UGC (University Grants Commission) has established the NAAC as an autonomous body to measure the higher educational institutions in India. The NAAC certification is obligatory for all the higher learning Instantiation, both the Government and Aided colleges of Andhra Pradesh. Without NAAC authorization, colleges are not qualified for UGC grants, RUSA findings, for evaluating the academic, administrative, co-curricular, extra- curricular activities of University, Colleges and Recognized Institutes in India.

**Keywords:** Quality Indicators, Library Performance, Library beyond libraries, Eligibility criteria, Academic Bank of Credits, Library Innovative techniques

## **INTRODUCTION**

According to the revised NAAC guidelines, the Library as a Learning Resource Centre incorporated in Criteria four Infrastructure and Learning Resources has been assigned for 20marks. The colleges which are preparing for NAAC accreditation can benefit from score points .by providing the following services to users like: Newspaper Clippings, Previous year Question papers, Suggestion Box/Register, Institutional Library membership, Budget, Book Exhibition, Digital Library, Inter library Loan & MOU, Library Management System, Career Information Services, Assistance for using use of library tools, and so on. The Government Degree colleges cater to the educational needs of students representing all sections of the society including the poorest, underprivileged communities residing in the remotest parts of the state of Andhra Pradesh and its neighbouring states. The Government Degree Colleges are imparting higher Education to around 1,12,174 students. The Commissionerate of Collegiate Education administers 166 Government Degree Colleges and 55 Aided Degree Colleges and with 4000 teaching faculty members, working to impart holistic education, with knowledge and skills in these Government Degree Colleges.

*The libraries and the librarians can contribute a lot in the development of the institution's accreditation. Hence library and librarian can play an important role and contribute a lot in the assessment and accreditation process. Thus accreditation process will contribute to the all round development of Government Degree College libraries in Andhra Pradesh.*

“To make quality the defining element of Higher education in India through a combination of self and external quality Evaluation, promotion and sustenance”.

Higher Education Institutions play a major role in the development of the State and the nation as a whole. Assessment and Accreditation has been instrument for quality assurance, measurement and sustenance in the Higher Education System. Performance of any educational system is measured by its Grade obtained in NAAC. In the accreditation process whole system of the Higher Education institution is brought under scanner. It has developed a mechanism through well framed quality indicator or guidelines which takes care of role played by every component as a separate input unit. This helps in checking the progress of the institution from all angles in the context of the quality. Libraries play an important role in meeting the educational community's information needs. Libraries can assist parent institutions in exploring new avenues of academic research and productivity. Libraries and librarians are the foundation of academic productivity, with the potential to broaden and deepen the breadth and depth of creative work done by faculty and students in related disciplines. As a result, libraries and librarians can play an important role in the assessment and accreditation process of Library Learning Resource.

## **LITERATURE REVIEW**

The Total Quality management, Performance measurement of Library and evaluation of Library system in the light if various standards. Government Degree College Manuals (January 2023) explain the plan of action for every Government Degree College to prepare to achieve NAAC grade in Government Colleges (Chandwani, 2022). Role of libraries and librarians in NAAC Assessment, briefs out general information about NAAC, it also discusses in detail about criteria IV metrics and role of libraries and librarian played during SSR submission and NAAC peer team visit (Jange, 2021). The Performance and measurement of information Assessment and Accreditation has been instrument for quality assurance, measurements and sustained in the Higher Education System. The Library Management Principals, Five Laws of Library science etc., has been published in various primary and secondary sources since a long years, but today National assessment and Accreditation Council has become a guideline or mandatory for Libraries to achieve in the light of the parameters set out in NAAC Institutional Accreditation-Manual (October 2020). Specific few significant studies pertaining to NAAC and Libraries reported have been reviewed as under.

Accreditation is a continuous quality improvement programme that ensures standard procedures and functions that a University/ Autonomous College must follow. The library department has to follow certain guidelines prescribed by the Governing bodies, which have been reported in this article Patil (2021) studied in detail the guidelines laid down by different governing bodies. Lateef (2019) discussed the need for an academic audit, objectives of the audit, quality measurements, the actual status of libraries, remedial measures to improve the services of the library in every academic year. Kulkarni (2018) discussed the Librarian's role in the Institution's overall NAAC process in light of revised framework.

## **Role of libraries and the librarians in NAAC process**

Librarians have to play two basic roles, first as a member of the college team and second as a leader of the Library. The areas where they he can actively participate are, Higher Education Institution (HEI) Registration, Information for quality Assessment (IIQA) Submission Self-Study Report (SSR) Submission, Quantitative Metrics (QnM) Assessment. Librarian can be anchor, host to plan NAAC related meetings and awareness programs, Librarian may help and guide institute in creation of website, web pages, use of ICT etc, Librarian can make available NAAC related literature, self-study reports of other universities and colleges etc. Librarian can help in planning, communication, management, presentation and every activity, NAAC and Academic audit has to maintain many types of records library and librarian can support in maintenance of records. Library supports curricular aspects of the institution by maintaining curriculum of different programs and its supporting website.

The world is becoming a global village today. To compete with world, higher education has nationally comparable and internationally acceptable “standards” and “quality” has become essential in Higher education. UGC an apex body in the higher education in India is entrusted with the responsibility of developments in the higher education at national level. The UGC has established the National Assessment and Accreditation Council (NAAC) is now obligatory to the higher education institutions.

Library can render special services for advanced learners and slow learners. Librarian may help teachers by providing e-resources for their effective teaching with ICT.. Librarian is teacher hence he/she will contribute in percentage of the institute full time teacher with Ph.D. Being full time teacher Librarians awards, recognition, and fellowship at State, National, and International level from government, recognized bodies will add in feather of the institution.

In addition, his personal research project will add weightage. Experiences of the librarian should be added in teaching experience. Library can support capability enhancement and development schemes viz. Guidance for competitive examination.

Library provide IT facilities including Wi-Fi, Facilities for e-content development. Librarian can support activities like competitive examinations, Career counselling, soft skill development. Effectiveness of Library committee which includes student members is evident through minutes of meetings and implementation of their resolutions.

## **Preparation of College Library for NAAC Accreditation:**

The number of users accessing the College Libraries physically as well as through e- access needs to be calculated. The usage statics of using databases like N LIST, DELNET, etc, login derails of the repository, the digital library, Web- OPAC can be uploaded in this metric. As the

1. Librarians must be completely aware of his Library collection development policy, accession registers, services provided, activities undertaken, software used for automation (if applicable), subscription details of journals, e-resources, the role of the library in the development of the college, etc.
2. The Librarian must also project academic achievements, qualifications, publications, activities undertaken for promotion of libraries services, and administrative duties other than the libraries.
3. Photo Gallery with sub titles.
4. Collection development policy, Acquisition details, quotation, Files, Purchase orders of Books and Non-Book materials, Accession Registers, Bill files, Payment Receipts, Audit Reports, Serials Information, Circulation Reports, OPAC, Web OPAC services needs to be shown to the peer team.
5. At the entrance of the Library or in any prominent place board featuring ‘ Library at a Glance’ should be put mentioning Number of Volumes, Number of titles, Books purchased under regular budget or with the funds of UGC, Book Bank, Number of Journals and Periodicals,

Newspapers, CDs/ VCDs, e- resources subscribed, Databases Subscribed, details of Institutional Memberships.

6. Display small size flex/colour print-outs focusing the 05 years Library Collection details, Year wise college Library Budget, Year wise Journal/periodical Subscribed, Year wise subscription Amount, Bound volumes, Library Activities, Services Provided, Any Special Achievements of the Library, Highlight Rare Collection (if ) and knowledge Resources, Photos of Library programmes.
7. Librarian should also include a few points highlighting personal achievements, publication, h-index etc.
8. Minutes book of Library Committee with Agenda and Action Taken Report should be maintain, signed by the Librarian and Principal along with all other members.
9. The Library maintains a ledger, than that should also be signed and shown to the team. Accession register should be signed by the Librarian and Principal at the end of each financial year. Proper Library Collection statistics should be noted in the register.
10. If the Library is partially/fully automated then show the peer team how the circulation is carried out, book reservation, bar-coding, stock-taking and stock-verification process etc.
11. New arrivals display racks should be maintained either manually or automated.
12. The Librarian, as well as the library staff members needs to plan out the visit in such a way that each and every library staff gets an opportunity to represent some activity service of the library. Such a proper distribution of work levels a positive impact on team members.
13. Library should be clean, hygienic, well-lit, books should be arranged as per DDC/CC shelf/cupboard levels, general rules and regulations of library and stacking section should be displayed, how to search a book on the stack and through OPAC, Newspaper clippings file should be maintained, CC TV s should be installed for security purposes, Wifi routers should be made available in the library, etc. If the library provides an E-newspaper Clippings facility, than that needs to be shown to the peer team.
14. The Librarian must show the Library Website to the team and services provided through it can be explained briefly. This will provide the remote access provided by the library to the learning resources.
15. If the Librarians is well versed with ICT, must help in other academic and administrative sections.
16. The Librarian should explain the importance of the library in a way that will make the team members feel that it is the ' Heart of the Institution'
17. Maintain records regarding Library Orientation Programmes, Awareness Sessions, Workshops, Seminars Organized by the Academic Library.
18. The role of the Library in Academics, extra-curricular and co-carricular activities should be mentioned.
19. Conduct annual Academic and Administrative Audit (AAA) of the Library and Information Centre.
20. Maintain the initiatives taken by the librarian for the student and faculty members.

### **Institutional Repositories (IR)**

The libraries should take a key role to establish the IRs to preserve and make accessible the digital content of scholarly publications. The libraries and the librarians play a crucial role in enhancing the visibility and importance of institutions for which they serve by actively taking part in the building, maintenance and sustenance of IRs. The libraries will also come to rescue of individual authors by helping them deposit their Content into the IR and also deposit the content on behalf of the individuals

who can self-archive their content. The Library Review, suggests that libraries and librarians are well placed to give input to the metadata and digital preservation activities inherent in building IRs and made a strong case for librarian mediated deposit rather than pure-self archiving as the future of building IRs. The IR is an online locus for collecting and preserving - in digital form – the intellectual output of an institution, particularly a research institution.

### **Profile of the Department of Collegiate Education**

The Directorate of Public Instruction (DPI) that managed all educational Institutions, both at Secondary and Collegiate level was bifurcated as Directorate of School Education and Directorate of Higher Education in the 1975. The Directorate of Higher Education was entrusted with the responsibility of the Management of Degree and Junior (+2) Colleges in the State. Over the years, due to enormous increase in the number of junior and Degree colleges, and its admiration of these two sectors of Higher Education become difficult for a single Head of the Department. In order to give special attention to these two areas of education, the Directorate of Higher Education was further divided into Directorate of Collegiate Education and Directorate of Intermediate (+2) during 31.10.1989. The Directorate of collegiate Education came into existence on 01.11.1989. The Head of Collegiate Education deals with the matters Undergraduate and postgraduate both the Government and Private Aided Colleges in the State of Andhra Pradesh.

### **Details of Government Degree Colleges (GDCs) of Andhra Pradesh**

<b>S.No.</b>	<b>Status</b>	<b>GDCs</b>
1	No. of Government Colleges	166
2	Autonomous Colleges	14
3	College with Potential for Excellence among autonomous colleges	3. (Rajahmundry, Guntur and Nellore)
4	Department of Biotechnology Star Colleges	1. Anantpur
5	Colleges with valid NAAC grade	27
	NAAC “A” grade Colleges	09
6	UGC B.Voc. Courses from 2020-21	28
7	Apprenticeship- Embedded Degree Programs	18
8	NIRF Rankings in 2020	3
9	NIRF Ranking in 2021	1
10	Women’s College	24
11	Nodel Resource Centres	16
12	ISO certifications	100

### **Library as a Learning Resource**

The library holdings in terms of books, journals and other learning materials and technology-aided learning mechanisms which enable students to acquire information, knowledge and skills required for their study programmes. A recent development in the field due to availability of digital means, the functioning of the library has undergone a drastic change. Automation of library using the ILMS, use of e-journals and books, providing remote access to e-resources in the library have become a matter of necessity. Providing for these and such other developments as well as utilizing them well are important indicators of the quality of an academic institutions.

## **INTEGRATED LIBRARY MANAGEMENT SYSTEM**

An Integrated Library Management System is a computer-based system used to manage internal and external resources including tangible assets, financial resources, materials, and human resources. It performs library automation and collection development tasks broken down into different models that are focused on simplifying tasks such as acquisition, cataloguing, and circulation commonly done in any library. An Integrated Library System usually comprises a relational database, software to interact with that database, and two graphical user interfaces. Most of the Integrated Library Systems, separate software functions into discrete programs called modules which are integrated with a unified interface. Modules are:

- acquisitions (ordering, receiving, and invoicing materials)
- cataloguing (classifying and indexing materials)
- circulation (lending materials to patrons and receiving them back)
- serials (tracking magazine, journals, and newspaper holdings)
- online public access catalogue or OPAC (public user interface)

The Higher Education Institution needs to mention partial or fully automated. Only having a computerized database of books and not using other modules of Integrated Library Management System should never be considered a fully automated library. Also, it is very important to understand that going for advanced and costly technologies like RFID is not feasible for every college due to budget constraints. Proper software selection is essential and will be helpful in generating several reports required for NAAC as well as it should be user-friendly in nature. Few examples are Koha, e-Granthalaya, NewGenLib, Libsys, and SOUL.

## **LIBRARIES BEST PRACTICES FOR ENHANCING THE ACADEMIC INFORMATION:**

In the library context, the best practice may be those services through which the users are able to explore more resources and facilities from the library. This includes steps taken by the library to attract more users by creating a suitable academic information environment. Here the library is expected to focus on users' needs while introducing new services and facilities to them. Guidelines speak about the best practices in relation to new developments in the field. Service introduced as a best practice today may turn into an essential one. Previously internet access in the library was considered the best practice but today it has become an essential service. Best practices questions include computerization of library with standard digital software, inclusion of sufficient information about the library in the college prospectus, compiling student/teacher attendance statistics and locating the same on the notice board, displaying newspaper clippings on the notice board periodically, career employment information services, internet facilities, information literacy programs, suggestion box, displaying new arrivals, circulating a list of those to academic departments, conducting book exhibitions on different occasions, organizing book talks, instituting annual best user award for students, best intellectual library award, organizing competitions annually and conducting user surveys periodically.

## **BEST PRACTICES FOR LIBRARIES**

The library receives a predetermined weightage of 20 marks out of a total of 1000 under Criterion IV, Infrastructure and Learning Resources. Those institutes and colleges that are preparing for NAAC accreditation can benefit from some pointers. They should provide the following services to users:



## **1. Library User Award**

To motivate the users to make the efficient use of the library and its services to the extent possible, library has the provision to confer “Best User Award” which is being selected as his/her regular visit to the library, behaviour & interaction with the library staff, suggestions for betterment and library usage. The library department should hold an annual seminar/workshop/conference and award "Best User" status to regular library visitors. This practice indirectly helps to transform the potential users into active users' library. It should observe National Library week to bring awareness among the students to make the best use of the facilities available in the college libraries. This practice indirectly helps to transform the potential users into active users.

## **2. Newspaper Clippings**

The library should keep clipping files on various topics of student interest and Institute demand. Some informative news clips are also displayed on the notice board. Librarians should maintain Notice File which contains one copy of every notice in this file. Users can access the Current Awareness Service (CAS) via email and a bulletin board. On the library's notice board, information from various websites should be displayed.

## **3. Previous Year Question Papers**

All previous year's subject question papers should be filed. Scanned question papers should be kept in a digital library for users' convenience. Besides its eBooks, Syllabus, E-resources are the part of Digital library.

## **4. Suggestion Box / Register**

A suggestion box should be kept in the library for valuable suggestions from users, or a suggestion register should be kept in the library and presented to the library committee to resolve the user's problems.

## **5. Institutional Library Membership**

A librarian should be a member of DELNET, National Digital Library, Inflibnet, British Council Library, American Library, and other institutional library memberships.

## **6. Budget**

The library department proposed an annual budget for the year. The library budget should grow proportionally. Budgets for various documents such as books, journals, and other resources, as well as ICT infrastructure, must be defined in accordance with the institute's scope. Other than state, central, and UGC grants, other sources of income could be identified to improve the collection and services. The last five years' budget file should be in the library.

## **7. Book Exhibitions**

The librarian should organize a book exhibition in the institute to help with book selection. Faculty and students visit the exhibition to learn about new book titles.

## **8. Digital Libraries**

A digital library is a collection of documents in organized electronic form that is available on the Internet or on CD-ROM discs. Depending on the library, a user may be able to access e-resources, magazine articles, e-books, papers, audio, and videos. Should a digital library have at least 10 computers for users? The report on e-resource users should be organized by year.

## **9. Inter Library Loan & MOU**

To share reading materials and E-resources, the library department should have a memorandum of understanding (MOU) with other organizations. As users are aware, all libraries whether academic, public or special ones, build collections to fulfil the needs of their users as well as to support the mission of the parent institutions to which they belong. However, no library even the largest one, can afford to have a sufficient collection to satisfy all the requirements of its users. At times, the user requires a document that is not available in its own library, but available in some other library. For this libraries usually have an agreement with other libraries to share their resources on reciprocal basis. Under this agreement the required document is borrowed from other library on Inter Library Loan and is given to the user.

## **10. Library Management Systems (LMS)**

The library Management system acts as a tool to transform traditional libraries into digital libraries. Library Management system is an application refer to other library system and it is suitable to use by small and medium size library. The LMS supports the librarian to add/view/delete/update details from the library stock. The Library Management system to upgrade the management to meet the need of the student demand. The Library Management system helps librarian record every book transaction so that the problem such as file missing or record missing will not happened again.

## **11. Career Information Services**

Library should provide career information service to students, keep separate section of this service and keep job related reading material in this section.

## **12. Assistance in the use of library and library tools**

Assistance in the use of library collection and library tools such as catalogue including OPAC (Online Public Access Catalogue), reference books, etc is provided to the users, who are not familiar with the library. This information is sought by the user, who visits the library for the first time. Such readers need directional guidance in the use of the library. They need to know the general layout of the library, location of the newspapers and magazines display racks, location of the textbooks and reference books, availability of card catalogue or computer terminal for searching the library collection, etc.

## **13. Library Policies**

The Library should have approved policies on collection development support, book issuance, the introduction of new services, financial support in the form of a fund, an annual budget, a book bank, binding procedures, weeding out books, and a policy on book loss, as well as an ongoing commitment of the institution to deputing library professionals for continuing and further education. NAAC promotes quality and excellence in higher education, as well as the importance of libraries and information services in improving the academic environment. According to the NAAC document on Best Practices in Academic Libraries, "Best Practices may be innovative and be a philosophy, policy,

and Strategy programme, Process, or Practice that solves a problem or creates new opportunities and has a positive impact on organizations." NAAC developed a set of Best Practices for Academic Libraries, which are organized into four broad categories:

1. Management of Library and Information Services
2. Collection and Services Provided to Users
3. Extent of the Use of Services
4. Use of Technology

#### **14. User orientations**

Libraries, particularly academic libraries, normally organize 'user orientation' programmes for the new students every year in the beginning of the academic session. Such programmes acquaint the user with the library and its facilities such as general rules and regulations of the library, the library collection and its location, catalogue of the library and how to use it, lending and borrowing facilities, etc. The basic aim of the user orientation programmes is to introduce the library and its services to the new user.

#### **National assessment and accreditation council (NAAC)**

The NAAC is an autonomous institute of the UGC established in 1994 at Bangalore. The core values of the NAAC are contributing to the National Development, Fostering global competencies among students, inculcating a value system among students, promoting the use of technology. The NAAC vision is "To make quality the defining element of higher education in India through a combination of self and external quality evaluation, promotion, and sustenance initiatives".

#### **The mission of the NAAC states**

- To arrange for periodic assessment and accreditation of institutions of higher education or units thereof or specific academic programmes or projects.
  - To stimulate the academic environment for promotion of quality in teaching- learning and research in higher education institutions.
  - To encourage self- evaluation, accountability, autonomy and innovations in higher education.
  - To Undertake quality related research studies, consultancy and training programmers.
- To collaborate with other stakeholders of higher education for quality evaluation, pro

#### **Best Services for Academic College Libraries**

The library has a key role in supporting the academic activities of the institutions by establishing, maintaining and promoting library and information services, both quantitatively and qualitatively. The library offers a wide range of services from reference to electronic information services. College libraries may answer the following basic questions for ensuring appropriate services to the academic community. Performance evaluation of college libraries needs to be carried out at regular intervals in order to sustain and enhance their quality. Normally, the evaluation can be made on compilation of use statistics.

Now a day's ICT plays a very important role in Library. Number of books, Journals are available in the form of CD's, DVDs, E-books, E-journals, E-Resources and online databases etc. also the libraries & there Bibliographical Databases available Online.

Accreditation criteria need to introduce IT in Libraries, and also colleges are highly involved in research activity so they need recent information, online journals, Internet facility etc., After evaluation

it is found that the college libraries in Rural area are introduced IT in their Libraries, also the colleges of science faculty are mostly used the IT services in there libraries.

Listed below are some of the best practices that can enhance the academic information environment and usability.

- Computerization of library with standard digital software.
- Conducting book exhibitions on different occasions.
- Compiling student/teacher attendance statistics and locating the same on the notice board
- Inclusion of sufficient information about the library in the college prospectus.
- Displaying new arrivals and circulating a list of those to academic departments.
- Displaying newspaper clippings on the notice board periodically.
- Career/Employment Information/ Services.
- Internet Facilities to different user groups.
- Information literacy programs.
- Suggestion box and timely response.
- Organizing book talks.
- Instituting Annual Best User award for students.
- Organizing competitions annually.
- Conducting user surveys periodically.

## CONCLUSION

The libraries play a major role in catering to the information needs of educational community, significant role for libraries to lead the parent institutions in pursuing new modes of academic research and productivity. Libraries and librarians are base of academic productivity, with a potential to expand both the range and depth of creative work carried out by the faculty and students in corresponding disciplines. It has considered all tasks which shall improve the quality of library services which in turn will reflect in education. Hence library and librarian can play an important role and contribute a lot in the assessment and accreditation process. On the basis of predefined criteria's the present study was carried out of "Impact of Library in NAAC for better visibility in enhancing research: An analysis of Higher Education in India". LIS Professionals always perform key role in the whole NAAC process as they are strong supporter to academic activities, publication and research output of the Higher Education. Library is a learning resource. NAAC policy helps in developing the college libraries to make modernize and to provide good standard service to users. This is the best methodology for measuring themselves to find deficiency to enhance the library services, which support get maximum score based on certain criteria's, this paper clearly explains importance in maintaining the library to full fill the quality for the NAAC policy. NAAC's main aim is to uphold the quality of higher education in the country and it requires a lot of hard work.

As earlier, we said the library is the heart of any institution and it should be properly managed. Institutions/organizations/universities should provide infrastructure facilities to their libraries regularly so that they can perform their duties/services properly. NAAC has given several guidelines to improve the library. At last, we can say that NAAC really improves the services of higher education.

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# Towards Harmonization of Library and Information Science Curriculum in India: Some Observations

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## ABSTRACT

The education in every discipline is in a revolutionary process including Library and Information Science (LIS). Among all the changes occurred in LIS education, the ones that are most visible and observable can be found in the LIS curricula. Library and Information Science (LIS) education in India is largely a twentieth century phenomenon. In India, LIS education is provided by different institutions like traditional and open universities, Private universities, affiliated colleges, etc. This paper presents the concept of LIS curriculum, and its need to review and development process. Outlines the landmarks in the development of LIS curriculum in India. The status and observations on LIS curriculum in India has been discussed. Examines the problems associated with the UGC model LIS curriculum development. Provides the action plan and steps to be taken towards harmonization of LIS curriculum in India. The efforts of national professional associations in the development of LIS curriculum. Concludes that, the LIS schools in India must adapt themselves to the changing environment so that they can turn out products, which are able to meet the challenges posed by the changing environment.

**Keywords:** LIS education, Curriculum development, LIS curriculum, Harmonization, India

## INTRODUCTION

Library and Information Science (LIS) education in India is largely a twentieth century phenomenon. It has a history of more than a century and has developed into a distinct discipline to meet the growing dimensions of library services consequent to the changing needs of society. Training and education for Library and Information Science in India dates back to 1911 and marched almost with developed countries of the world. Dr. S.R. Ranganathan has played an important role in standardising and developing the courses of various levels, course content, training of teachers, as well as research in LIS. There are few more pioneers who have also made significant contribution to Indian LIS education. In India, LIS education is provided by different institutions like traditional and open universities, private universities, affiliated colleges, etc. There has been a phenomenal growth in the education of LIS, but it is a matter of regret that the growth has not been healthy. Currently more than 150 institutions are offering courses leading to bachelor's degree and about 100 universities offering Master's degrees and a good number of universities offer M.Phil and doctoral programmes in LIS

The following are the trends in LIS education in India:

- Developments in information technology and services have a major impact on curriculum design, and it is common for a curriculum to change with the time and technology.
- It becomes harder to determine the core while electives tend to be the mainstream in course selections.
- There appears to be an increasing emphasis on theory and research in course content.

- Lifelong learning becomes the focal point in curriculum development.

## **CURRICULUM**

Curriculum plays a vital role to improve the quality of education and LIS is not an exception to this phenomenon. Curriculum in LIS has been the major focus today which has been witnessed from the literature published in journals and conference proceedings especially by Indian Association of Teachers of Library and Information Science (IATLIS). Among all the changes occurred in LIS education, the one that is most visible and observable can be found in the LIS curricula. That is, the curriculum for LIS education usually mirrors what is being offered to train librarians and information professionals' knowledge and skills to become qualified personnel in the field, but also meet challenges the ever changing information society brings (Chu, 2006). A curriculum is a fundamental part of any education or training programmes largely because it provides not only a LIS of courses or modules offered in a programme, but it also gives information on content, purpose, method, time / duration, trainers and location or situation of a programme or course all of which are essential in a successful dispensation of manpower training and education (Ocholla, 2003).

## **NEED TO REVIEW THE CURRICULUM OF LIS EDUCATION IN INDIA**

India has one of the largest LIS education systems, and currently it confronts with many problems such as, variations in the curriculum, norms or standards for development of curriculum, fall of research growth, lesser student-teacher ratio, lack of infrastructure, uniformity in courses, admission process, intake, teaching methodology, evaluation methods and research programs etc. Hence, its necessary to trace the developments in the curriculum of LIS education in India (Manu et al. 2018).

There are several reasons for the revision and updating of LIS curriculum. Some of them are:

- Paradigm shift in the information storage media, and dissemination process in the libraries where the LIS professionals need to operate
- Impact of internet in the access to information
- Influence of e-journals and other e-resources dominating in the libraries
- Shift in the collection development policy and process and other pricing models
- Evolution of Innovative teaching methods
- Transformation of traditional libraries to electronic, digital, virtual and hybrid libraries
- Emergence of information security acts like copyright act and IPR
- Emphasis on digital archiving of information materials
- Application of TQM and KM concepts in libraries
- Shift from Collection development to Content development
- Changing dynamics of user behavior and information use pattern
- Design and development of IRs
- Impact of Web technologies
- Impact of LIS Curriculum Development Committee reports of UGC
- Influence of government initiatives such as National Knowledge Commission (NKC), National Education Policy (NEP), 2020.

## QUESTIONS TO PONDER OVER LIS CURRICULUM

Many studies have questioned curriculum, content and teaching activities. The following are the questions to ponder over LIS curriculum:

1. Is the content of every discipline a job appropriate?
2. Is learning a process or a finished product (in the context of Pedagogy)?
3. Is teaching text book oriented?
4. Is curriculum flexible with respect to the individual learner's circumstances and needs?
5. Is the curriculum flexible enough to help learners to construct their own meanings?
6. Whether the curriculum seriously attempts to contextualize learning vis-à-vis the life and culture of students and help them to transcend the existing boundaries of their life?
7. Whether the curriculum is standardized, prescribed or externally controlled?
8. Are the assessment questions in the examination appropriated with the curriculum?
9. Whether the examinations follow the curriculum or curriculum follows examinations?
10. Does the curriculum encourage students to analyse the way humanity constructs, creates and transmits formal knowledge critically?
11. Does the teaching and learning prepare pupil only for examination? (Siddamallaiah and Karisiddappa, 2007)

## LANDMARKS IN THE LIS CURRICULUM DEVELOPMENT IN INDIA

LIS Curriculum is generally changed by every Indian university once in every few years to accommodate the new ideas generated in the field. This also helps in purging the redundant ideas and imbibing the new ideals. LIS curriculum change has been an inevitable continuous phenomenon in India. At the university level, the UGC mainly controls the general course structure of curricula. Since its inception, UGC has given due emphasis to curriculum design for LIS departments, along with developments in university and college libraries. The first such review committee is known as Ranganathan Committee (Ranganathan, 1965) on Library science education entitled "Library science in Indian Universities". In 1980s, a marked change in LIS education programme was required due to the introduction of IT into the Library field. As a result the next attempt for the revision was initiated by the UGC in the early 1990s. The UGC constituted CDC (Curriculum Development Committee) on LIS under the Chairmanship of Prof. P.N. Kaula (1993). The report of this committee was published in 1992 under the title "Report of the curriculum development committee on library & information science." The publication of this curriculum helped the university departments to update their syllabi as per the requirement in the profession during these periods. Soon after this, many changes occurred in ICT sector, which had a direct impact on the libraries. This made the UGC to undertake a study on the previous report of CDC on LIS. It was felt that immediate restructuring of CDC report was further required to reconsider. The committee discussed all the aspects of the curriculum and finally proposed modular syllabi for Indian Universities. This report was published in 2001 under the title "UGC model curriculum, Library & Information science" by C.R. Karisiddappa (2001) being the Chairman. The CDC (2001) recommended that *"in view of the emerging network environment, in view of the fundamental shift in the goals of the library, and in view of the changes in information storage and delivery mechanisms, the educational programmes should cater the needs of these changed settings by including in their course contents, the knowledge and skills required to function effectively in such an environment"*. It stated the learning objectives for each module, expected outcomes of the modules, the syllabi is divided into distinct units, and the whole thing revolves around a balance of theory and practice (60:40 ratio). The model curriculum designed by the Karisiddappa Committee (2001) made maximum efforts to incorporate a considerable number of IT components. At the same time the report



has recommend that the *“revision of syllabus is required to be undertaken very cautiously with break – even manner, not entirely overawed either by the invasion of IT or by sentimental attachment to various philosophical and historical components”*. One important feature is that a part of the report contains a detailed syllabus for a 2-year integrated programme leading to MLIS along with the marking pattern, number of credits, number of hours of teaching theory and practice. Out of all the syllabi published so far, this syllabus seems to be useful and, therefore, soon after its publication, majority of the Indian universities have modified their course structure as per the CDC report (2001). Both committees framed the syllabuses to bring standardization in LIS education in India. The second curriculum committee laid emphasis on two-year integrated master’s degree course and its implementation. After these two CDCs (Curriculum Development Committees), no committee was formed for the reforms in LIS education.

## **STATUS OF LIS CURRICULUM IN INDIA**

Most of the curriculum followed in Indian LIS programs is outdated with little or no focus on the requirements of libraries or IT organizations. Programs may have traditional courses like classification and cataloguing, reference, bibliographic searching, and professional values, but the curriculum does not reflect the current needs of LIS field. LIS Curriculum is generally changed by every Indian university once in every few years to accommodate the new ideas generated in the field. This also helps in purging the redundant ideas and imbibing the new ideals. The following are the factors that characterize the present LIS curriculum in India:

- No harmonization of curriculum among LIS schools
- No periodic revision of curriculum
- Lack of Innovation in curriculum
- Curriculum of LIS to address adequately the education of librarians (Ramesh Babu and Butdisuwan, 2013).

## **OBSERVATIONS ON THE LIS CURRICULUM IN INDIA**

- The nomenclature of the Degrees in LIS varies from one university to the other. 14 types of nomenclature have been noticed namely, Information Science and Information Studies, Library and Information Science, and Library Science etc. (CDC 2001).
- The titles of degrees such as BLIS/BLISc or MLIS/MLISc /M.Sc., are noticed in the Indian Universities.
- It is found most of the universities have adopted Credit Based System or Choice Based Credit system.
- There exists variation in the total number of credits from one university to the other. Almost all the core courses in Master’s degree have 3 or 4 credits and Electives are with 2 or 3 credits.
- The titles of the courses also not uniform. In a majority of the courses the nomenclature varies from one to the other universities. But it is observed that core titles /subjects are followed to a larger extent.
- There are courses for “Independent Study” which is a unique feature of Credit system as seen in some of the LIS schools.
- In all the universities the submission of project report/ dissertation is not compulsory.

- ICT components are largely stressed besides traditional LIS subjects. There exists a perfect blending of traditional as well as current subjects are being taught, of course medium of instruction in some universities is in regional languages.
- Curricula of BLISc and MLISc are not uniform in library and information science schools, very little emphasis is given to the components that the LIS professionals need to carry out on the tasks in the library when they join the given job.
- The course duration at each level is also not uniform in the LIS schools. Most of the LIS schools have two years Master's level with four semesters.
- Presently there is a wide disparity in the courses, their duration, number and titles of papers, contents, number of lectures and practical periods, methods of teaching and evaluation, and grading system.
- In many universities the LIS syllabi are quite old and they need to be restructured with redefined objectives to accommodate emerging changes in the libraries and expectations of users.
- Currently, most of the university departments in India are having common syllabi for teaching the LIS subjects. However, there exist some lacunas at some level for which the LIS professionals in India are still to get full satisfaction of the present curriculum and teaching.
- Although the impact of CDC has been there in the designing of the curricula, however, it is observed that each university has framed the curricula on their own. Each university is autonomous in this context.

## **PROBLEMS IN UGC MODEL CURRICULUM DEVELOPMENT**

Some problems in curriculum development are:

UGC modular approach was based on local conditions and needs. The model curriculum of LIS suggested by the CDC was based on a modular approach and the modules incorporated in the model curriculum could be used as a basis for designing an actual curriculum, keeping in view local conditions and needs (UGC 2001). The curriculum must be global in nature with local suitability.

UGC model curriculum was not adopted: In most universities, this model curriculum was unfortunately not adopted, as the role of the UGC was to make recommendations rather than accrediting. An accrediting body like ALA in the US should be created for uniform adoption of a standard curriculum.

Many universities are following old LIS syllabi. They are not updated accordingly to the undergoing changes in the society. The last curriculum development committee was set up by UGC in 2001. After that, no such revision was implemented. There is huge disparity in LIS curriculum of the universities. In 2011, UGC has implemented CBCS (Choice Based Credit System) for all undergraduate courses except for library and information science. "The CBCS is an internationally acknowledged instructional pattern developed to suit the needs of the students and to enable them to keep pace with the developments in higher education across the globe. The genesis of the CBCS is traced to 'Cafeteria system,' in vogue in the West" (Sarkhel, 2014). It is based on transfer of credits for a course. Presently, twelve universities have taken their own initiative to implement the CBCS curriculum for the LIS courses.

The biggest challenge for the LIS education providers in India is how to eliminate the shadow of gap between theory and practice on the one hand, and between push and pull technology on the other.

The Indian LIS schools should develop LIS curricula and training programs keeping in view the real life information problems and needs. Lack of funds, faculty, brilliant students, infrastructure, learning resources, courses consistent with the job-market, and gap between theory and practice are some of the lingering issues that continue to bother LIS schools all the time.

## **ACTION PLAN**

Today the library and information science education is no more an education to the managers of libraries only. But it has become an education to the consumers of knowledge from libraries. It is a change from managing libraries by librarian to manage the flow of information by one and all and it is an integral part of general education. Earlier the trend was that the persons learn this education and the learners become librarians. Now the trend is that the professionals teach this science and learners choose different walks of life and use this education in the occupation to manage the information. (Gangadhara Rao and Ramesh Babu, 1988). The curriculum and the content of LIS education shall be consistent with the present information landscape. LIS education has to adopt and adapt new sharable pedagogical strategy considering the needs of the ever changing information landscape, knowledge settings, ICT and employment opportunities. There is need to redesign LIS curriculum with the advancement of technology in libraries. The curriculum shall maintain balance between both traditional and ICT components. The training should be oriented to the exact nature of requirements in Indian libraries. Special courses may be introduced to train personnel required in different types of libraries and information centers; Each student should undergo a minimum period of practical training in any recognised institution as an intern or apprentice before being granted the certificate of the degree obtained. The last 100 years of LIS education have seen many transitions, contrasts, and contradictions. The transition is one of the most welcome and significant development. As of today, LIS education is on the threshold of facing new challenges of the new century. Great expectations however are in store to establish its durability and survival in the next millennium. If the departments of LIS in India are to sustain the challenges they have to set global standards in LIS education at least for the Asian region. The task is stupendous and involves drastic and progressive changes in the curriculum and building the LIS courses in India in light of the happenings in the International arena, the adoption of modular approach is a way of meeting the present and future needs of a dynamic curriculum (Ramesh Babu, 2014). Thus, the education and training programs in LIS must make a provision to prepare the professionals to assume the pro-active role in coping with new technology and the information explosion. In brief the designed course contents should concentrate in developing knowledge, skills and tools corresponding to the four basic identified areas namely, creation, collection, communication and consolidation. It is hoped that this approach will would serve as a guideline to the future curriculum designing activities in the developing countries.

*“The challenge for the LIS schools is to revamp their facilities and course curricula to transform into institutions that educate and train professionals who are competent enough to create a stir in the market, a demand for their skills, societal hunt for their talents, and who can substantially contribute to management of knowledge resources, dissemination of information and create a often sought after brand name for their service and niche for themselves”* (Malhan, 2009).

The library schools should assume the role of leadership and responsibility to produce competent manpower for the present as well as future needs of different kinds of information centers including University libraries by introducing the workable and feasible curriculum. To quote Lancaster (1983), *“We must shift the focus of our professional concern away from the Library as an institution and towards the skilled professionals, who will become a professional practitioner on par with medical and legal practitioners”* The LIS schools, therefore, must initiate research-based teaching and ensure more

emphasis on training keeping in view the vast potential of info-business. In the course contents, management issues are becoming as important as the technological concerns and technical areas of this discipline.

## **TOWARDS HARMONIZATION OF LIS CURRICULUM**

It has been observed that the course contents, the number of papers and the duration of the courses slightly differ from one university to university and differ from State to State. As early as in 1987, IFLA has urged the harmonization of LIS education and training programmes. A glance at the LIS syllabi of various library schools at different levels that it would be possible and feasible to implement the idea of harmonization of programme of LIS education and training from its broad perspective. The UGC through its CDC Report (2001) has recommended in this direction. There shall be collaborative curriculum development among the universities /institutions which would result in the harmonization of LIS education. Such an effort would result in the promotion of quality in LIS education and training. The outcome of designing the LIS curricula shall emphasize the slogan “TEACH AND LEARN BEYOND THE NATION” and on par with the other developing countries (Choon and Ramesh Babu 2013).

The most significant way of achieving internationalism in LIS education is to revise and improve the curriculum which affects all students despite whether they can take part in exchange programs or not. One of the innovative courses in colleges and universities might be the one where students from every sector can share their thoughts, knowledge and personal experience on the proposed topics, events or life spheres. One of the umbrella concepts to be addressed is such learning explorative contexts is world librarianship and/or global librarianship. The international curricula should be a curriculum that prepares graduates for defined international profession; curricula leading to internationally recognized professional qualifications and interdisciplinary program, such as regional and area studies covering more than one country, and curricula in which the traditional/regional course area is broadened by international and cross-cultural/intercultural approaches.

The curricula must be overhauled drastically if we want to retain our identity in a rapidly developing information society. There is the need to look at the curricula of LIS globally. The IFLA (2000) has emphasized on the LIS core curriculum on three aspects such as Conceptual knowledge, Professional capabilities and technological and technical competencies. This has to be considered while designing LIS curricula. Further LIS curricula shall focus on the traditional and current subjects to update the trends and perspectives on the globalization of LIS education programmes. All the universities offering LIS courses need to ensure for the periodic revision of the curriculum in consultation with other universities or in consortia approach.

## **RESTRUCTURING OF LIS COURSES**

Many changes have come about in the curriculum of LIS courses in response to the changing conditions, demands and trends in the information environment. The new dimensions in LIS have been influencing the curriculum.

The following factors have contributed for the restructuring of LIS Courses:

- Increased volume and variety of information sources and diversity of techniques used to access these sources.
- Systems analysis and management techniques being applied extensively in the Library and Information Centres.

- The emerging demand for digital librarians and digital libraries.
- Increased demand for the effective bibliographical control of information and creation of databases in various branches of knowledge.
- Obsolete curriculum now in vogue in many library schools. It has been often lamented that the current course contents of LIS programmes shows no relevance of the subject to the present day information demands.
- Lack of training/internship programme during study period or absence of internship module in the courses.
- Traditional teaching methods being used.
- Ever changing employer's needs and demands
- Use of ICT in Libraries
- Changing curricula of UGC Net or SLET and examination pattern
- Changing dimensions in subjects like Information management, Preservation, Bibliographic standards, Knowledge organisation, Information resources and the like.

It is observed that most of the LIS schools in India do not impart education on modern courses and hardly come up to the international standard. Moreover, they do not reflect the latest changes resulted by ICT. Much of the courses are theory based ones. The need for restructuring the LIS programmes has become more acute in the face of fierce competition both at institutions and with the profession. The design and structure of LIS curriculum shall be planned scientifically to assure continuity, balance, harmony and unity in educational programme so as to facilitate international recognition. In this context it is pertinent to quote, *“Library Science schools should achieve and maintain an optimal balance between those aspects of librarianship that are likely to change in the nearer or long term future... effective professional education must incorporate both veracity with respect to the present and sensitivity with respect to future”* (Galvin, 1976).

## **EFFORTS OF NATIONAL LEVEL PROFESSIONAL ASSOCIATIONS**

Professional associations and organizations such as ILA, IASLIC, IATLIS, and SIS are also helping to revise curricula to meet current demands. ILA organized the 22nd All India conference, “Library and Information Science curriculum for 3rd World Countries,” in 1987. IASLIC organized a conference on “LIS Profession in India: Vision 2010.” IATLIS organized a national seminar in 2000, “Infrastructure Facility for LIS Education and Research in India.” SIS also organized a conference in 2000, “Accepting the Challenges of IT Re-inventing the LIS Profession in the New Millennium.” LIS education in India would benefit from translating the contents of these events into action. The traditional LIS curriculum followed by most schools in India demonstrates an urgent need to develop a model curriculum to meet contemporary needs. UGC Model Curriculum 2001 has become outdated because of the technological gap between 2001 and the present.

## **CONCLUSION**

Curriculum cannot be developed in isolation, but it has to recognize the social, economic, political, and technological environment in which the LIS professionals have to function. Curriculum development has to consider the needs of the information environment and the expectations of the LIS employers while designing the education and training programme. It is very essential to establish some professional

agency at the national level, which can undertake the work of accreditation of the courses in LIS that may maintain the standard in LIS curricula, nomenclature, and duration and course fee. There should be a common platform for all library schools that conduct courses both on campus and off campus courses. Because of the multi-disciplinary nature of the new information jobs, the LIS courses should provide the learners with necessary skills with which they can gain employment upon graduation, as well as give them a vision and understanding to cope with the rapidly changing world. The period after 1980s has witnessed a great transition due to the impact of computer and communication technology which is responsible for the emergence of an 'Information Society' and 'Global Village'. Therefore, it has become essential that curricula be revised by reducing emphasis on teaching of traditional techniques and philosophical aspects to incorporate emerging areas such as computer and communication technology, knowledge management, online information sources, and marketing of products and services. Revised curriculum should be capable of preparing the future professionals in order to meet the challenges enforced upon them from time to time.

There is a need for rejuvenating the LIS courses in India in light of the happenings in the International arena, and the adoption of modular approach is a way of meeting the present and future needs of a dynamic curriculum. Library schools that are not able to adapt themselves may become irrelevant and have to close down sooner or later in the years to come. History has a lesson to teach. In United States of America, those library schools which did not move with times, were either closed down or got merged with other schools dealing with information science/information studies (Barron, 1991). LIS profession has undergone in paradigm shifts due to technological changes. To go along the changes, LIS education needs to be revamped. All LIS departments and professional associations across the country should come together to bring the uniform standardization in the LIS education according to the present needs (Khanchandan, 2019). It is the high time where LIS Departments have to take a leap forward approach and continuously revise their syllabus to incorporate appropriate technological topics in their curricula. In view of the above, it is desirable that the LIS schools in India must adapt themselves to the changing environment so that they can turn out products, which are able to meet the challenges posed by the changing environment.

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# Virtual Event Platforms: Emerging Tools and Trends

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## ABSTRACT

Due to a lot of reasons, the way of teaching and learning is changing especially after the COVID-19 pandemic situation across the globe and the change opens new opportunities for teachers, students and other stakeholders of education and research. The virtual event platform (VEP) is an important tool widely used after the COVID-19 pandemic situation. VEP is an online platform that allows us to conduct meetings, time-to-time mentoring and training of employees, and much more, at very low costs, through the Internet. The VEP also known as web conferencing platform are computer software that enables users to have a meeting virtually or communicate through the Internet. Virtual event platforms are not only helpful for tech support or customer support even they play a major role in education as they make it possible to do much more – between screen sharing, video conferencing and online whiteboard tools. The global video conferencing market is expected to grow at a compound annual growth rate (CAGR) of 19.7% over the years 2021 to 2026 and reach a net worth of 22.7 billion by the year 2026. In this context, this paper attempts to investigate the top best free virtual event platforms like *Zoom, Google Meet, Zoho Meeting, Skype, Microsoft Teams, BigBlueButton, BlueJeans, Livestock, etc., its features, advantages and limitations.*

**Keywords:** Virtual Event Platform, Video conferencing, Web conferencing platform, Online education, COVID-19

## INTRODUCTION

Due to a lot of reasons, the way of teaching and learning is changing especially after the COVID-19 pandemic situation across the globe and the change opens new opportunities for teachers, students and other stakeholders of education and research. In fact, we have entered into a new era in education where a major shift taken place in most classrooms i.e. the incorporation of blended, flipped and online learning methodologies, supported by virtual event platforms or video conferencing or web conferencing platforms. The virtual event platforms have several benefits and can really bring us classroom to life.

Virtual event platform (VEP) is an online platform that allows us to conduct meetings, time-to-time mentoring and training of employees, and much more, at very low costs, through the Internet. The VEP also known as web conferencing platform are computer software that enables users to have a meeting virtually or communicate through the Internet. These platforms are divided into two main types viz., (i) platforms offer audio and video communication only; and (ii) platforms offer audio, video and features like document sharing, access to the desktop, and editing during the virtual meeting.

The VEP facilitates authorised users to attend such meetings from anywhere else. The VEP also offers us many features like easy audio and video conferencing, video recording, analytics, notifications, video encryption, screen sharing, and more. In addition, this platform offers different privacy features so that only authorized participants can sign in to a certain meeting. They also made the functioning of businesses very smooth as well as productive at the same time. These platforms have proved to be highly beneficial in times of pandemic, when not only businesses, but educational institutions also suffered a big setback. The VEPs made it possible for these organizations to run even in such situations.

The global video conferencing market is expected to grow at a compound annual growth rate (CAGR) of 19.7% over the years 2021 to 2026 and reach a net worth of 22.7 billion by the year 2026. And the same time, if you are looking for a virtual event platform, you need not have to break out your company credit card. Between completely free open-source apps, or provider's that offer a freemium version of their paid service, there is actually a larger list of completely free virtual event platforms with screen sharing out there than you might think.

## **VIRTUAL EVENT PLATFORM**

Virtual event platform software is an online service that has audio conferencing and video conferencing solutions. These tools allow for webinars, toll-free calling, HD video meetings, and training held by presenters either live or recorded.

Virtual event platforms are not only helpful for tech support or customer support even they play a major role in education as they make it possible to do much more – between screen sharing, video conferencing and online whiteboard tools. This paper attempts to round up a solid list of the top best free virtual event platforms, all of which include screen sharing and provide an overview of its various features.

The virtual event platforms use built-in cameras, speakers, and microphones or external devices and allow for high-quality face-to-face video meetings or group phone calls over an internet connection. These tools include the ability for free screen sharing and setting up virtual conference rooms for attendees to collaborate.

## **FREE VIRTUAL EVENT PLATFORMS**

There are many free virtual event platforms available on the Internet while many subscription based platforms also available. Some of the subscription based virtual platforms also provide free versions with some limitations. The following are some of the important free virtual event platforms.

- *Zoom*
- *Google Meet*
- *Zoho Meeting*
- *Skype*
- *Microsoft Teams,*
- *BigBlueButton*
- *BlueJeans*
- *Livestorm*
- *OpenMeetings*
- *GoToMeeting*
- *Join.me*
- *ezTalks Meetings*
- *Pexip*

## **FEATURES OF FREE VIRTUAL EVENT PLATFORMS**

### **ZOOM**

Zoom is a popular and free online meeting software. Zoom allows us to do face-to-face meetings with anyone, anytime, from any device. The Basic plan, which allows online meetings with up to 100 attendees, allows individuals as well as small businesses to use the platform for free. The only drawback with this plan is that the meeting is allowed to last for a maximum of 40 minutes. Plus, you get whiteboards and chatting, and file-sharing features with this plan. The ease of use that Zoom offers makes it a widely accepted and recommended platform. The security and privacy features are also commendable.

#### **Significant features**

- *Easy-to-use tools for starting, joining, collaborating, and scheduling meetings.*
- *Allows you to join from anywhere, from any device.*
- *Powerful security features include the 256-bit Advanced Encryption Standard (AES), suspending any participants, audio signatures, and more.*
- *Integration with 2000+ applications.*
- *Mobile applications for Android and iPhone users.*
- *Meeting recording and transcribing features.*

#### **Advantages**

- *Allows online meetings on all devices.*
- *Easy to use.*
- *SOC 2 Type II, SOC 2 + HITRUST, ISO 27001 compliance, CSA STAR Level 2 Attestation.*
- *A highly useful free version.*
- *Allows up to 1000 video participants.*

#### **Limitation**

- *The video downloading features need to be improved.*

In the present situation, Zoom is a highly trusted and renowned platform for online meetings. Though Zoom is one of the best online meeting platforms for large groups, the higher plans are a bit costly, but the range of features that they offer is praiseworthy. 95% of the users of Zoom claim that they have achieved an increment in performance and trust, and 93% of them have reported a greater sense of engagement. While Zoom offers a free version, the paid version is available in different plans such as Pro, Business, Business Plus, Enterprise and the subscription cost differs depending upon the plan.

### **GOOGLE MEET**

Google Meet is another widely used VEP across the globe which is designed for users to join a virtual meeting and share videos or speak to each other from different locations via the Internet. It was launched to the public in March 2017 and its userbase has increased by more than 30 times in 2020 due to the global COVID-19 pandemic that compelled individuals and organisations to utilize digital communication tools and platforms for remote learning and work. Google Meet is free for all Google users. The free version supports up to 100 participants and the time limit for free users is 60 minutes.

#### **Significant features**

Google Meet has features that make it optimal for learning institutions and these features include;

- *Recording*

- *Scheduling meetings*
- *Screen sharing*
- *Comprehensive tools for productivity and interactivity*
- *Polling for real-time decision making*
- *File and image sharing*
- *Text-based chat.*

Google Meet is available as a free and paid services provide a lot of added advantages and facilities. Livestreams can accommodate approximately 1,00,000 students. The paid services include G Suite basic, G Suite Business, G Suite Enterprise, that enables a user to host more participants in a single meeting.

## **ZOHO MEETING**

Zoho Meeting is best for businesses of all sizes that want interactive and engaging online meetings. It is a 25-year-old, highly trusted, and advanced platform that offers a number of business solutions including Remote work management, Identity and access management, Enterprise service management, Unified endpoint management and security, IT operations management, Advanced IT analytics, Security information and event management, and much more. It is a popular virtual event platform that is trusted by more than 280,000 organizations, including Bahrain Airport Services, Certis, HCL, Vizstone, Sony, and L’Oreal Paris. Zoho Meeting is a secure video conferencing solution that is easy to use and highly powerful.

### **Significant features**

- *Live audio and video conferencing tools with whiteboard and screen-sharing tools.*
- *Allows you to record, download, and replay your meeting videos.*
- *Detailed analysis and reporting tools for the webinars that you conduct.*
- *Seamless integration with Microsoft Teams, Gmail, Outlook, and many more platforms.*

### **Advantages**

- *Web-based meetings*
- *Mobile applications for iOS as well as Android users*
- *Affordable prices*
- *The free version as well as the free trial.*

### **Limitations**

- *Some users have complained that sometimes long video conferences stop in between.*

Zoho Meeting is one of the top free virtual event platforms that allows up to 100 participants at a time. The paid plans allow you to add more participants with more advanced features. It offers us a high range of features at absolutely reasonable prices. The features include real-time chat recording, reporting and analytics, Q&A management, screen sharing, file sharing, and more. There is a free version available and a 14-day free trial is also offered. The market segment of this platform is consisting of 79% small-business and 13% mid-market.

Owned, developed and hosted by the networking and security giant, Cisco, you can be sure WebEx scores high on our list. One of the original conference solutions, of course Cisco has it nailed down pretty well. Just like others on the list, the free version of WebEx will limit you to 3 participants, but the good thing about WebEx is that it allows for free video conferencing. Users can of

course share their screens, and you can even integrate the platform with Cisco Spark, one of our favourite Slack competitors, to build your own complete collaboration suite of software.

## **SKYPE**

Skype, which is built by Microsoft, is one of the best virtual event platforms out there. It is an all-in-one solution for instant messaging, video conferencing, calling, and document collaboration. **Skype is best for** affordable voice calling and free HD video calling.

This free virtual collaboration platform is highly recommended. It allows you to join meetings with just one click. Skype Web allows you to just log in and connect with your friends from anywhere. Even when your friends are not on Skype, you can make local or international voice calls or send text messages on their number, through Skype, at affordable rates. Screen sharing, smart messaging, call recording, and live subtitles are praiseworthy. The platform offers you standard security through encryption.

### **Significant features**

- Allows 1:1 or group audio as well as HD video calling.
- *The smart messaging features include @Mention (to refer to someone) and more.*
- *Integrated screen-sharing tools that allow you to share anything, including photos, presentations, videos, etc.*
- *Call recording and live subtitles.*
- *Offers affordable international calling*
- *Compatible with phones, Web, Desktops, Xbox, Alexa, and Tablets.*

### **Advantages**

- *Supports all devices.*
- *End-to-end encryption for your private conversations.*
- *No need to sign in or download the application to join the call.*
- *You can get a local phone number, call or send an SMS via Skype.*

### **Limitations**

- *Users have experienced some sound quality issues as the number of participants increases.*
- *Do not allow more than 100 participants.*

Skype is trusted by hundreds of millions of people from all over the world. The platform is recommended for individual as well as professional use. The platform is free, simple, and can be used by anyone. The online calling feature is commendable. It makes international calling extremely affordable and easy. Skype to Skype calling is absolutely free. With Skype, you can make free unlimited audio and video calls. You just need to pay for a local number or for making calls. Skype also provides unlimited plans which are priced.

## **MICROSOFT TEAMS**

Microsoft Teams is a chat-based workspace in Office 365. It brings together people, conversations and content along with the tools that teams need so they can easily collaborate to achieve more. While it is useful for any sector, Software engineers and consultants use this platform widely and the top industries using this platform includes Information Technology and Services and Computer software. The market segment of this platform is consisting of 42% enterprise and 37% mid-market.

## **BIGBLUEBUTTON**

BigBlueButton is an open source virtual platform that can be obtained and installed on any server for free and it is mainly useful for educational purposes. This was born out of the Technology Innovation Management (TIM) program at Carleton University's Institute for Technology Entrepreneurship and Commercialization in Ottawa, Canada and was launched externally in 2007.

It is completely open-source and was created to improve online learning. It is constantly evolving and improving through a dedicated, growing international user and developer community. As on date, there have been more than a dozen releases of the core product, and each new release has seen the development of new features, testing, and documentation as well as improved community support. The main focus of BigBlueButton is to support teaching with improved, online tools that allow teachers to connect with students in ways that are synchronized, collaborative and fun.

## **BLUEJEANS**

BlueJeans is the meetings platform for the modern workplace. We bring video, audio and web conferencing together with the collaboration tools people use every day. The first cloud service to connect desktops, mobile devices and room systems in one video meeting, BlueJeans makes meetings fast to join and simple to use, so people can work productively where and how they want. It is the meeting solution teams trust to do their best work.

BlueJeans is widely used by Software Engineers, Project Managers, etc. Information Technology and Services and computer software industries are widely using this platform. The market segment of this platform is consisting of 47% enterprise and 37% mid-market.

## **LIVESTORM**

Livestorm is the first video engagement platform to manage meetings, webinars and virtual events from start to finish. With Livestorm unblock traditional video conferencing silos and an end-to-end video engagement platform for our meetings and events. It helps get access to email templates and sequences, customizable registration pages, email delivery tracking, website widgets, built-in social sharing, and much more. Livestorm helps us to choose from a host of features to engage participants; launch polls, answer questions, send emojis, share files, and much more. The Livestorm's integrated dashboard helps o track registrations, attendance, and participant engagement. Livestorm is built with ease of use in mind. It is useful for companies of all sizes from startups to Fortune 500s. Sectors like technology, education, healthcare, government, media, real estate, etc. are using Livestorm and it is available in 24 languages, connecting users all over the world. The market segment of this platform is consisting of 46% small business and 46% mid-market.

## **OPENMEETINGS**

OpenMeetings is actually a completely free, open-source web conferencing solution. With video conferencing, instant messaging, whiteboard capabilities, and collaborative document editing OpenMeetings does everything the other competitors would.

### **Significant features of OpenMeetings**

- *Audio and Video Conferencing*
- *Meeting recording and Screen sharing*
- *File Explorer*

- *Moderating System*
- *Multi-Whiteboard and Chat*
- *User and room management*
- *Private message center*
- *Plan meetings with integrated calendar*
- *Polls and Votes*
- *Backup*

Even with not too many options out there, all of these free web conferencing apps with screen sharing included in our list should manage to fill in any gaps your team may have. Between the open-source nature of Apache's OnlineMeeting, the cohesive Google Meet, or the IT-focused screen sharing of TeamViewer – your office shouldn't have to break out the credit card to subscribe to a web conferencing solution just yet.

## **GOTOMEETING**

GoToMeeting is probably one of the most popular virtual event platforms. The free version of GoToMeeting offers one of the simplest ways to host a conference call, and allow users to share their screen. With their one-click meeting solution, GoToMeeting should be really simple to adopt – and users can start their meetings through almost any app, from Microsoft Office programs to email and chat links. The developers have also introduced user roles recently which makes it easy to edit the permissions each user has — avoiding any security threats or accidental edits.

## **JOIN.ME**

This virtual platform was developed by the team that created the LogMeIn suite of tools for collaboration. Join.me is easy to use, even for beginners, and its one-click functionality seems to be the motivation behind the tools. The platform expands the one-click functionality beyond basic interoffice communications. It adds a layer that extends conferences to prospects, clients, and customers. The free plan is limited to conferencing and screen sharing. The free trial of the advanced plans includes free audio conferencing that comes with its own dedicated conference call number in the U.S.A. and more than 40 other countries. There is also video conferencing. The one-click scheduling can be integrated with Google Calendar and Outlook to maintain and organize your invitations. Another feature is the creation of a permanent meeting location. This lets clients save the address to stay in contact with the business. The online whiteboard feature provides an extra level of collaboration, screen sharing, and presentation.

## **EZTALKS MEETINGS**

ezTalks Meetings is definitely one of the best free virtual event platforms available right now. The platform not only provides free HD web video conferencing, but also provides powerful online whiteboard collaboration tools, so that team members can all see the notes and sketches of their colleagues on the online whiteboard. ezTalks Meetings can also support up to 100 people on one web conference. This platform is much useful for educational and training purposes.

## **PEXIP**

Pexip is another best web virtual event platform. What's great about Pexip is that they allow us to host the web conferences ourself on-premise, or we can choose to host them on a cloud service like Microsoft

Azure, Google Cloud, or Amazon Web Services. The Pexip service is scalable and customizable and allows business to integrate traditional video systems.

Each option has its benefits, and limitations, but it will all come down to how your team plans to use each solution, and what features would be best to have. Of course, Zoom and Google Meet are undoubtedly the most widely adopted solutions on this list and their free plans make them the perfect choice for small businesses. No matter what your use case may be, there's surely an ideal option out there.

## **VIRTUAL EVENT PLATFORM AND EDUCATION**

We know very well that the physical interaction between humans has steadily decreased over the past few years as a result of the COVID-19 pandemic. As a result, the adoption of virtual event platforms has seen a huge increase in conducting technology mediated interactions are now the order of the day. The virtualization of meetings promotes collaboration among teachers and students, colleagues, target markets, associates, working towards the organization's objectives.

Another exciting feature of the virtual event platform is that it can be used in so many different ways in the classroom. For example, it is useful for asynchronous learning i.e. teachers can pre-record entire lessons or lectures that students can then watch later on their own time which will be highly useful for class environments with large amounts of students scattered in different locations. On the other hand, it also helps for synchronous learning as the teacher can use this platform to conduct live class almost the same as you would an in-person class.

Using virtual event platforms in learning meets the primary goal of both educators and students. It facilitates the creation of the best learning environment for students and aids in the realization of a balance between life and teaching duties for teachers.

Though virtual event platforms, higher educational institutions have the ability to capitalize on the available technologies to expand access to instructors online while also creating new experiences in the teaching and learning environment.

The elimination of the need to travel for students' field trips has also been realised due to technological advances, and virtual tours have replaced the trips. Many studies proved that the virtual event platforms played a major role in teaching and learning.

## **ADVANTAGES OF USING VIRTUAL EVENT PLATFORMS FOR EDUCATION**

Using a virtual event platform for education provides a number of advantages to the stakeholders of education and some of the significant advantages are furnished below.

### **(a) Collaboration of Students and Educators**

The major advantage of using virtual event platform for educational purposes is the collaboration among students. Apart from student collaboration, these platforms can also be used between teachers to quickly share ideas and materials through an online meeting, webinar, or casual chat. They will also helpful to reach out to connect to educators in other places and regions to explore new ideas and perspectives.

### **(b) Sharing of Content**

Another great advantage of using VEP in education is the capability to share enriching materials and files with our students to enhance our lessons. These platforms empower teachers and students the possibility to share files and multimedia in real-time. When learning remotely, the ability to quickly and efficiently share materials makes group work or projects possible.



### **(c) Connects around the Globe**

The VEP connects students and teachers around the globe. We know that the distance learning can make some students feel isolated, but by using VEP, they are allowed to connect with their peers in an authentic way and this is more engaging than other traditional learning methods.

### **(d) Recording for Future**

VEP helps us to record the lessons for future reference. The VEP gives us the ability to record our lessons as they are happening and old students can take advantage of this feature. The VEP also helps students to take control of their own learning and discover the learning process that works best for them. Students who were absent from a lesson can watch the play-back (recorded lesson) and get caught up quickly and efficiently as if they never missed the class at all.

Further, screen share can be used to create group activities viz., quizzes, problem sets, to be worked on during class meetings; provide examples and illustrations; offer a forum for students to work collaboratively outside of class on documents, spreadsheets, and presentations for assignments and projects. Similarly, group text chat can be used to conduct polls and surveys. VEP is also helpful to organise special guest lectures by inviting experts and faculty regardless of their location.

## **LIMITATIONS OF VIRTUAL EVENT PLATFORMS**

Though using of virtual event platforms for educational purposes offer many advantages, there are some limitations too. The following are some of the limitations.

### **(a) Lack of Personal Interactions**

A lack of personal connections and face-to-face contact may cause the students to struggle to get to know their co-students, co-workers and develop personal connections with them. It is also important to note that not everyone is comfortable being on camera, so students might be shy, some teachers too. Sometimes, microphones can be noise-activated if they aren't on mute, so there may be some background noise in the beginning. So, it is important to sensitize the students about proper etiquette viz., not interrupting others who are speaking. Once we established etiquette and ground rules, the VEP will have more of a traditional classroom feeling.

Also keep in mind that while using video conferencing software, you and your students are most likely seeing each other only from the shoulders up. This means that things like body language and non-verbal communication can get lost. Knowing this, you can use your voice in ways to convey emphasis on certain points, or tone to stress importance. Don't be afraid to use some gestures as well.

### **(b) Network Issues**

Network connectivity issue is a major limitation of virtual event platforms. In general, office settings will have reliable network connectivity as well as backup options in case the Wi-fi network goes down and home networks rarely have backup options. Bandwidth is another issue, for example, multiple people are on video conferences simultaneously. It may also cause lagging video or audio and dropped calls. Similarly, the digital divide is also a limitation while the urban people will have better connectivity while people in rural and remote locations may not have access to better network connectivity and bandwidth.

### **(c) Security**

Security is still another limitation of the virtual event platforms. During 2020, hackers took advantage of the boost in video conferencing usage and increased their attempts to infiltrate and disrupt virtual meetings to create chaos. Especially, the Zoom faced scrutiny for several publicized meeting disruptions

from internet trolls and caused many IT experts to worry about internal meeting's security. Though, many of the current virtual platforms have safeguards in places that ensure only authorized attendees can join private meetings using their login credentials, still we cannot assure the virtual event platforms are 100% secured.

#### **(d) Compliance with Laws and Regulations**

Another important limitation of using virtual event platform for education is compliance with laws and regulations of different states, regions and countries. Sometime, recording some meetings may be illegal without all attendees' approval. So, now most of the VEP offer audible announcements to confirm the meeting is being recorded and this functionality is configurable.

### **CONCLUSION**

Before COVID-19 pandemic, virtual event platforms received little attention from academic institutions, as most of them utilized physical classes and lectures. The pandemic changed the entire scenario and the academic institutes struggle to sustain their level of learning facilitation as people find it difficult to travel from one region to another. So, the virtual event platforms started playing a major role in education and the academic institutions across the globe started using them to continue functioning. Though some scholars believe that physical classes are more efficient for learning than virtual platform, it is inevitable that the role of virtual event platforms in education is steadily increasing globally as they allow for a collaborative approach to learning through interaction, facilitation and team construction of knowledge.

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# Some Issues of LIS Education for Public Librarianship in 21st Century Japan

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## ABSTRACT

In 2023, 193 academic institutions (152 four-year colleges and universities and 41 junior colleges) offer LIS education for public librarianship in Japan. It is estimated that every year approximately 10,000 students will earn the certificate for public librarianship. However, approximately 100 graduates received their jobs in the public libraries in 2018, and this number has not changed for last ten years. The total number of staff of public libraries was 42,772 in 2021, and many of them were part-time staff. In addition, many of them were employed by private companies. It is suspected that such conditions are mainly caused by the LIS education for public librarianship. The author discusses these issues and proposes his own idea of LIS education for public librarianship in 21<sup>st</sup> Century Japan.

**Keywords:** LIS education, Public librarianship, Japan

## INTRODUCTION

Japan has two laws concerning libraries, *Toshokan Hou* (the *Library Act*) and *Gakkou Toshokan Hou* (the *School Library Act*). *Toshokan Hou* concerns public libraries only and regulates establishment of public libraries including qualifications of a professional librarian who works in the library. Japan also has *Toshokan Hou Shikou Kisoku* (*Library Act Enforcement Decree*). The *Decree* includes LIS education for public librarianship. However, it is up to local government to determine whether a public library should be established. Any local government that decides to establish a public library must enact a library ordinance, which is done by its board of education.

In the environment mentioned above, Japan has some issues of LIS education for public librarianship which have delayed the professionalization of public librarianship.

## LITERATURE REVIEW

There is no literature discussing this topic.

## LIBRARY ACT AND LIBRARY ACT ENFORCEMENT DECREE

### 1. Library Act

*Toshokan Hou* (2019) states as follows:

- Article 4. Librarian and Library Assistant

1) The professional staff of libraries shall be called a librarian (shisho) and a library assistant (shishoho).

2) A librarian shall be engaged in the professional works of the library.

3) A library assistant shall assist a librarian.

- Article 5. A person who satisfies one of the following provisions shall be qualified as a librarian.

1) Graduate of a 'daigaku' 1) who has completed library science program under the provisions made by the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT). Or a person who has completed both the first half (2 years) of a 4-year professional school and library science program under the provisions made by MEXT.

2) Graduate of a college or a higher vocational school and has completed a short course of library science.

3) Library assistant (sishoho); 2) who has three-year's experienced in the library work and completed a short course of library science (ex. summer course).

## 2. Library Act Enforcement Decree

*Toshokan Hou Shikou Kisoku* states as follows:

1) A graduate of a college who has completed the LIS program listed below is qualified as a librarian.

(Core Courses) (Each course is two credits)

- ① Lifelong Learning
- ② Introduction to Library Science
- ③ Library law, Regulations and Management
- ④ Library and Information Technology
- ⑤ Introduction to Library Services
- ⑥ Information Services
- ⑦ Children's Services
- ⑧ Seminar in Information Services
- ⑨ Introduction to Library and Information Resources
- ⑩ Organization of Information Resources,
- ⑪ Seminar in Information Resources.

(Elective Courses) (Each course is one credit. Two courses should be completed)

- ① Special Topics in Library Science
- ② Special Topics in Library Services
- ③ Special Topics in Library and Information Resources
- ④ History of Books and Libraries
- ⑤ Library Facilities
- ⑥ Comprehensive Seminar in Library Science
- ⑦ Practicum.

## COLLEGES AND UNIVERSITIES THAT OFFER LIS PROGRAMS FOR PUBLIC LIBRARIANSHIP AND THE NUMBER OF STUDENTS WHO EARN THE CERTIFICATE

Library Year Book (2014) stated that 216 academic institutions (158 four-year colleges and universities and 58 junior colleges) offered LIS programs for public librarianship in 2014. Library Year Book (2021) stated that 209 academic institutions (158 four-year colleges and universities and 51 junior colleges) offered those programs in 2019. According to MEXT (2023), 193 academic institutions (152 four-year colleges and universities and 41 junior colleges) offer those programs in 2023. Thus, there have been

over 190 academic institutions in Japan which offered LIS programs for public librarianship for last ten years, though its number has been decreasing recently. It is peculiar that 139 of the 152 four-year colleges and universities are private institutions and 39 of the 41 junior colleges are private institutions.

According to Jukerabo Yobik (2023), it is estimated that every year approximately 10,000 students will earn a certificate for public librarianship. However, Senmonshoku Seido Kentou Inkai (The Reviewing Committee of Library Profession) (2019), which was established by Japan Library Association (JLA) in 2017, stated in its report that approximately 100 graduates received their jobs in the public libraries in 2018. The Committee also stated that the number of graduates was much higher when compared to number a few years ago.

Why have so many students enrolled in LIS programs and received their certificates for public librarianship every year, knowing the difficulty of getting jobs in the public libraries? One of the reasons is that students want to acquire any kind of certification as a memento of college education since almost all college students can graduate without much study once they pass the entrance examination to colleges or universities. In other word, modern Japanese college students are said to be ‘qualification-mania’ (certification enthusiasts). Those students who are enrolled in LIS programs and receive their certificates for public librarianship are not necessarily interested in librarianship. They just want to earn some kind of certificate.

In above situation, many private colleges and universities offer LIS programs in order to solicit new students to their institutions since it is easy to establish a LIS program for public librarianship. This situation explains why 139 of the 152 four-year colleges and universities and 39 of the 41 junior colleges which offer LIS programs for public librarianship are private institutions in 2023.

MEXT requires that a college or a university should have two full-time LIS instructors when it establishes a new program. However, MEXT rarely examines whether the minimum number of staff are maintained. Another fact is that MEXT is not strict in examining qualifications of the two instructors. Although an institution which offers a LIS program is obliged to report to MEXT every year, many colleges list in their annual reports names of the faculty who are not necessarily LIS majored.

In Japan there is a law called Shakai Kyouiku Hou (Social Education Law). The Library Act is enacted as a sub-law of Social Education Law, and another sub-law is Hakubutsukan Hou (Museum Act). These two acts are considered educational laws for lifelong learning. In comparison with teacher’s requirements in Gakkou Kyouiku Hou (School Education Law), professional staff’s requirements in the acts for lifelong learning are not strict. A specialized teacher’s certificate has also been introduced for a candidate who has a graduate degree. There is no such provision in the Library Act or the Museum Act.

Another concern is that the Library Act still allows a junior college graduate who finishes LIS program to earn a professional librarian’s certificate. Asahi Newspaper (2014) reported that more than 50% of the cohort in Japan go to four-year colleges or universities. In such a situation, it is hard to persuade employers of public libraries (boards of education of local governments) to employ LIS graduates as professional librarians, though JLA argues that these graduates qualify as professional. It is also hard to let the public at large, who graduated from four-year colleges or universities, believe that a person who earned his/her certificate at a junior college is qualified as a professional librarian, considering that librarianship is a learned profession.

Although MEXT has no intent of changing the basic education requirement for public librarianship, which is junior college education, it has tried to increase the number of credits of LIS courses. MEXT set up Toshokan ni Kansuru Kamoku no Arikata Kentou Kyouryokusha Kaigi (Reviewing Committee of LIS Courses). The Kaigi (Reviewing Committee of LIS Courses) (2009) recommended that the LIS program requirements for public librarianship should be increased from 20

to 28 credits. The president of JLA (Nihon Toshokan Kyokai Rijichou: Shiomi Noboru, 2008) sent a letter to the Minister of MEXT, stating that 24 credits are the maximum that the present LIS programs could afford.

This implies that JLA, a quasi-professional association (I understand JLA as a quasi-professional association, not a professional association since any person who is interested in libraries can become a full member of the Association) does not want to level up the basic education requirement for public librarianship. JLA might have thought that it is impossible for a junior college to offer the LIS program if 28 credits are required. Consequently, as mentioned above, Library Act Enforcement Decree continues to require 24 credits of LIS courses to be completed to earn a public librarian's certificate, and this certificate can be earned with just education through at a junior college in 2023. For the record, the number of credits required for a public librarian's certificate was 15 in 1950, 19 in 1968, and 20 in 1996.

It should be added that the following happened. One member of MEXT's Reviewing Committee of LIS Courses (Nemoto, 2008) requested to discuss the basic education requirement, which is a junior college education, when the Committee reviewed the present situation. He was left out of the Committee member for the next reviewing by MEXT and never got called again for the discussion. This means that MEXT never really considered leveling up the LIS education for public librarianship as far as the basic education requirements are concerned.

## **STAFF OF THE PUBLIC LIBRARIES IN 2021**

According to Library Year Book (2022), there were 3,316 public libraries in 2021 and the total number of staff of those libraries was 42,772. The staff composition was as follows:

- Full-time employees: 9,459
- Concurrent employees: 1,100
- Non-full-time employees: 13,629
- Temporary employees: 4,068
- Consignment staff: 14,516

The list above shows that many non-full-time staff were employed in Japanese public libraries. It also shows that many staff (consignment staff) were employed by private companies. In fact, the number of library staff employed by private companies was largest among those staff. Considering that a public library is established by a local government and should basically be managed by government employees, it is difficult to comprehend the logic behind the staff composition in Japan's public library system.

Japanese local governments suffered from economic recession in 1990s and began to use New Public Management (NPM) in the public libraries with the intent to be more cost-effective. This is one of the reasons why so many non-full-time staff were employed. However, the ratio of full-time vs non-full-time staff is higher in the public libraries than in other public sectors, so the structure is not aligned with how other public sectors are organized. Hence it is still questionable why the public library system is structured with so many non-full-time employees.

Designated Manager System (DMS), which is a kind of NPM, was included in the Local Government Act revised in 2003. Thanks to DMS, many public service sectors of local governments have now been managed by private companies. Regarding public libraries, it is reported that 271 local governments in Japan had delegated the management of their libraries to designated management companies in 2021, and the total number of the libraries managed by these private companies was 632

(Library Year Book, 2022). This is one of the main reasons why so many consignment staff are employed in the public libraries in 2021. Can those designated management companies properly manage the public libraries? Those companies say ‘yes.’

Library Year Book (2022) states that the number of full-time employees decreased by 168 in 2021, as compared with the year before. This *Year Book* does not say anything about the number of professional librarians. However, Library Year Book (2019) stated that the number of professional staff, which included library assistants, was 8,017 in 1998, and that by 2017 this number was 5,375, decreasing by 2,642.

In reviewing JLA’s position statement, the author found the reason why the recent *Library Year Books*, which were published by JLA, did not include the number of professional librarians. JLA’s position statement (Japan Library Association, 2018) is that all library staff should be full-time certified librarians. Having awareness of crisis to the fact that many non-full-time staff have recently been employed in Japanese libraries, JLA Senmonshoku Seido Kentou Iinkai, whose purpose was to examine librarianship as a profession, proposed that all library staff in the public libraries should have certificates of public librarians.

The discourses above are a negation of librarians as professionals from the point of view of American and Western librarianship. But the discourses may not necessarily deny librarianship as a profession since JLA insists that all library works are professional. Leaders of JLA insist that all library workers should be equal as far as their works are concerned, except for managers. Librarianship was quickly professionalized in the United States in 1920s since Williamson (1971) argued that there were two kinds of library works, professional and nonprofessional, and that education for professionals should be separated from that for nonprofessionals. The author agrees with Williamson’s argument. And the author believe that professionalization of librarianship cannot be achieved unless we believe that the library works are divided into two: professional and nonprofessional.

In addition, JLA puts most efforts upon circulation services, which JLA think is the most important library services. JLA insists that the competent librarians should sit down on circulation counters to serve patrons, which is also different from U. S. perspective.

Boards of education of local governments which have the power to control the public libraries argue that the circulation services are performed by non-professionals and employ non-full-time staff for these services, and sometimes delegate the management of their libraries to designated management companies. Designated management companies argue that they can easily manage public libraries if circulation services are most important. They have often boasted that the libraries they have managed are among the best as far as the number of circulated materials is concerned.

## **PROPOSAL FOR LIS PROGRAM FOR PUBLIC LIBRARIANSHIP IN JAPAN**

In 2003, the Japan Society of Library and Information Science set up a project titled Library and Information Professions and Education Renewal (LIPER) to study future reorganization of LIS programs in Japan. The report of the Project (Japan Society of Library and Information Science, 2006) proposed graduate level of LIS programs for librarians in Japan, including public librarians. Some librarians criticized this proposal, arguing that the report proposed too high a level for LIS education, when considering the present condition in Japan. Most practicing librarians ignored the report. They thought that it had nothing to do with them and was viewed more as an academic study. When the manager of the Project took the report to MEXT, the staff in charge of public libraries within MEXT responded, saying that it is an academic study, not a proposal for practicing librarians from JLA.

The author argue that the present LIS program for public librarianship is not acceptable for professionals. The author proposes the following two kinds of LIS programs, considering its realizability in Japan.

(Proposal 1)

- 1) Change the present LIS program for librarians offered at junior colleges into LIS program for library assistants.
- 2) Change the present LIS program for librarians offered at four-year colleges and universities into disciplines (for example: major).
- 3) Establish advanced (or upper class) librarians for those who earn graduate level of LIS programs.

(Proposal 2)

- 1) Change the present LIS program for librarians offered at junior colleges into LIS program for library assistants.
- 2) Increase credit requirements of the present LIS program for librarians offered at four-year colleges and universities to more than 30 credits.
- 3) Establish advanced (or upper class) librarians for those who earn graduate level of LIS programs.

If Proposal 1 is put into practice, it can be comparable with the programs of some Western countries, though it is much lower in requirements when compared with U. S. programs. If Japanese librarians think that proposal 1 is impossible to be realized when considering the present condition, proposal 2 is recommended. This proposal will be one step toward enhancing the professionalization of public librarianship in Japan.

The author also proposes that three or four full-time instructional staff who are majored in library and information studies should be employed in the LIS program. The author understand that instructional staffs are of the same importance as the curriculum in LIS education.

## CONCLUSION

The author discussed some issues of LIS education for public librarianship in 21<sup>st</sup> century Japan. The first issue was that the Library Act admits that a student at a junior college can earn a professional public librarian's certificate. This is a much lower educational requirement in comparison with the United States. Some efforts were made in Japan by Japanese librarians to level up this situation, but there has been no significant progress. This makes officials of boards of education of local governments, who have control of the public libraries in Japan, believe that the certificate is sufficient for professional librarianship in the public libraries.

Another issue is that JLA's position statement states that all staff of a public library should have public librarian's certificates, and that JLA believes that the most important library service is circulation service. These two discourses make boards of education of local governments employ many non-full-time staff and often delegate the management of their libraries to designated management companies.

It is necessary to discuss educational requirements of a professional librarian, taking the examples of other countries into account. It is also necessary to discuss the kind of services to be offered by a professional librarian, taking the examples of other countries into account.



## NOTES

1) The usage of a word ‘daigaku’ (literal translation: college) in Japan is ambiguous, usually meaning a ‘four-year college’ or ‘university,’ but it can sometimes include a junior college. For instance, ‘daigaku’ which is used by *Daigaku Setchi Kijun (Standards for Establishment of Universities and Colleges)* issued in 1956 and revised in 2022 by Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT) is meant a ‘four-year college’ or ‘university.’ 【参考資料1】大学通信教育に関する基礎資料3 (mext.go.jp). But ‘daigaku’ as utilized in the Library Act is interpreted by MEXT to include a junior college.

2) A high school graduate who received a short course of library technology provided for him/her by MEXT can earn a certificate of library assistant (sishoho).

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# Factors Promoting Online Information Literacy Teaching in Chiang Mai University

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## ABSTRACT

The purpose of this research was to study factors that promote online information literacy teaching, including problems and obstacles in promoting information literacy online in terms of teachers, students, and information literacy courses, and information technology by surveying opinions from 425 students in the Faculty of Agro-Industry, Chiang Mai University. Statistics used for analysis were frequency, percentage, mean, standard deviation, multiple regression analysis, and Pearson correlation coefficient analysis. The results showed the overall opinions of undergraduate and graduate students towards the factors promoting online information literacy teaching and the problems and obstacles in teaching information literacy online were the same as the high level ( $\bar{x} = 4.32$ ). and moderate level ( $\bar{x} = 3.39$ ) respectively. The faculty of Agro-Industry Chiang Mai University has a total of 4 aspects, namely, the teaching aspect, the student aspect, and the curriculum for teaching information knowledge. And information technology is Statistically significant at the 0.05 level.

**Keywords:** Information literacy, Information literacy services, Promotion learning, Research support services, Education and teaching, Faculty of Agro-Industry Library, Chiang Mai University

## INTRODUCTION

The faculty of Agro-Industry Library Chiang Mai University has a duty to support the education Faculty of Agro-Industry Research, Including promoting cost-effective use of information resources. And promoting information literacy for sustainable education and research. During the recent outbreak of Coronavirus Disease 2019 (COVID-19), resulting in the library, the service area must be closed in 2021, according to the announcement from the government about temporary closure. In order not to cause the gathering of a group of people to gather together, Do not touch books, objects, and equipment together. Including being in a building with ventilation systems and the duration of the service together. In order to reduce the risk of infection and transmission of Coronavirus Disease 2019 (Department of Health, 2021), libraries in the new normal era must focus on online services. Modify work and provide services in line with the new normal in order to be able to carry out the mission of the library. Continuously with environmental factors, Technology, and such changing new normal, libraries must be ready to deal with changes in every situation (Pridi Pluemsamran, 2021) and provide services to service users without reducing work efficiency, and users can receive continuous service. There is no feeling that the service is less than received. In the beginning, libraries will have to change the way they work and provide services. By focusing on working in a fully online format, librarians should integrate knowledge in other fields, such as online teaching. Or bringing knowledge of technology applied to work in combination with knowledge of library science to create new methods or innovations in providing online services to service users. Subsequently, libraries should transform their roles into learning

resources that are available fully online. Both in providing basic services in various online formats, such as basic services, Research Support Services, and teaching services for information literacy skills, etc.

The provision of information literacy skills teaching services of the Faculty of Agro-Industry Library under the new normal is a service that must be provided continuously. For students and service users who have to study online from home to have information literacy skills and be able to access and evaluate the information retrieved for use in the study daily living accurately and efficiently. This is in line with the new normal in today's libraries. Information technology and communication technologies have been used to teach full information literacy. But with the changes that occur, it is a sudden change. As a result, libraries must continue to provide services to teach library information literacy skills in an online form and other services. Immediately in conjunction with service planning for the efficiency and effectiveness of that service, Therefore, the researcher intends to conduct a research study on the study of factors promoting online information literacy teaching for students of the Faculty of Agro-Industry Chiang Mai University To study factors that promote online information literacy teaching. Study the problems and obstacles in the operation. And to study opinions and suggestions about promoting online information literacy. To be most efficient and effective for service users.

## **LITERATURE REVIEW**

The researcher reviewed the literature. by studying the research on factors promoting information literacy teaching to design a questionnaire, such as the Instructor factor, student factor, Information literacy teaching curriculum factors, and information technology factors. A research study related to the analysis of factors affecting information literacy. It has been studied extensively and is especially interesting by Chitchaya Korsanthia (2013), who has studied the factors affecting Promoting the teaching and learning of information literacy for students. Undergraduate Vongchavalitkul University found that the main factor 6.

The aspects that affected information literacy at a high level were: 1) University administration, 2) Information technology infrastructure, 3. Teaching and learning information literacy 4. Role of the room Book 5) roles of instructors and 6) personal factors of students. And the research of Wallapa Chalermwongsawet (2015), who studied Factors influencing the information literacy of students in private universities, found that the factors or variables that were components of information literacy of students were: 1) Identification, 2) Scope setting, 3) Gathering 4) Planning 5) Presentation 6) Management and 7) Evaluation and in the research of foreign scholars, Arenas, Rodriguez, Gomez & Arenas (2004) found that the factors that make students not aware of information related to the educational system are teaching methods that Have students take notes—using textbooks as learning media and the use of outdated information. Therefore, information-literate students must use a collaborative approach between professors and librarians. The teacher must encourage students to learn by specifying activities related to the use of information and access to information. To assign exercises to put students into practice, librarians must actively drive activities that enhance the educational environment. And librarians must play a role in guiding students to the learning process. And a study by Armstrong & Georgas (2006) that looked at online information literacy programs as a contributing factor to the development of online learning found that the quality of information literacy programs was an important factor in improving information literacy. Student Mutula, Kalusopa, Moahi & Wamukoya (2006) found that teaching information literacy online improves students' information literacy skills more than face-to-face teaching. Face each other, And students will appreciate a blend of teaching methods, including in-curricular information literacy and online teaching, to develop self-learning, which must rely on various components related to the availability of ICT infrastructure, content design, student digital literacy, and the necessary online networking support. Researchers at the University of

Niger Delta University, Nigeria Baro & Fyneman (2009) found that gender factors affect information literacy. Male students will know and use the information accessible on campus. Students can learn about digital and the use of the Internet provided by university libraries, and use search engines and CD-ROMs in e-libraries. They also had more search strategies than female students. In addition, the research of Detlor, Julien, Willson, Serenko & Lavallee (2011) examined the factors affecting students' academic performance in business schools' information literacy instruction. 'Business School' found that the factors of learning environment Components of an information literacy program and student demographic data will affect student learning outcomes in information literacy instruction.

In addition, the researcher studied theories and research related to the study. By presenting the following topics:

1. Basic Concepts of 21st-Century Information Literacy Skills
  - 1.1 Definition of information literacy
  - 1.2 The importance of information literacy
  - 1.3 Information Literacy Skills
  - 1.4 Scope of Information Literacy
  - 1.5 Information Literacy Standards
2. Information literacy for higher education
  - 2.1 The importance of teaching and learning information literacy in higher education institutions
  - 2.2 Teaching information literacy
  - 2.3 Information Literacy Teaching of the Faculty of Agro-Industry Library
  - 2.4 Problems and Obstacles to the Promotion of Information Literacy in Educational Institutions
3. Library services under the epidemic situation of the Coronavirus Disease 2019 (COVID-19)
  - 3.1 Information about Coronavirus Disease 2019 (COVID-19)
  - 3.2 Public Health Practices for Preventing the Spread of the Coronavirus 2019 (COVID-19) for Public Libraries Community library Private Libraries and book houses
4. Related research

## **Objectives**

1. To study the factors that promote online information literacy teaching. For students of the Faculty of Agro-Industry Chiang Mai University
2. Study the problems and obstacles in promoting online information literacy. For students of the Faculty of Agro-Industry Chiang Mai University.
3. Study opinions and suggestions on promoting information literacy online. For students of the Faculty of Agro-Industry Chiang Mai University.

## **Research hypothesis**

1. Teacher factor There was a correlation between the problems and obstacles in promoting online information literacy.
2. Learner factor There was a correlation between the problems and obstacles in promoting online information literacy.
3. Curriculum factors for teaching information literacy There was a correlation between the problems and obstacles in promoting online information literacy.

4. Information Technology Factors There was a correlation between the problems and obstacles in promoting online information literacy.

## RESEARCH METHODS

A research on the study of factors promoting online information literacy teaching for students of the Faculty of Agro-Industry Chiang Mai University There is research methods according to the research methodology, which consists of Studying and researching information and research related to the research topic. Population and sample determination design and construction of research tools testing tools data collection data analysis and presentation of the research report as follows:

The research population was students from the Faculty of Agro-Industry. Chiang Mai University had 1,431 undergraduate students and 95 graduate students, totalling 1,526 people, and the sample used in the research was 302 undergraduate students and 70 graduate students, counting 372 people by using the method. Cluster random sampling Samples were calculated using Crazy and Morgan's criteria. At a confidence level of 95% with a margin of error of 5%. Collect data from both paper and online questionnaires. From a sample of 372 people, in which the actual data collection Able to collect data from a sample of 425 people, which is more than what was specified.

The research tools were a questionnaire divided into four parts: Part 1: closed-ended questionnaire on general information of the respondents, namely gender, status, a field of study, and experience in attending information literacy skills training; Part 2: closed-ended questionnaire on Factors that promote online information literacy teaching consisted of 4 factors: teachers, learners, information literacy courses. And information technology; part 3 is a closed-ended questionnaire on information, problems, and obstacles in teaching information literacy online, and part 4 is an open-ended questionnaire on opinions and suggestions about teaching information literacy. Online format: The questionnaire was a 5-level estimation scale, checked for quality by three experts in library and information science and research to check the content's accuracy, completeness, and coverage. The clarity and linguistic appropriateness of the questions. After that, the validated questionnaires were used with 50 sets of populations to find the confidence value.

## RESULTS AND DISCUSSION

Research, a study of factors promoting online information literacy teaching for students of the Faculty of Agro-Industry Chiang Mai University. The study results, discussions, and recommendations from the research can be summarized as follows:

### **1. General information of respondents**

Of the 425 respondents, 387 were undergraduate students and 38 graduate students.

### **2. Opinions of undergraduate students and graduate students on various factors that promote online information literacy teaching**

The results showed that Undergraduate and graduate students' opinions towards the factors promoting online information literacy teaching were generally at a high level ( $\bar{x} = 4.32$ ) and could conclude their views on the various factors. that promote online information literacy teaching as follows:

2.1 Opinions on the teaching factor It was found that undergraduate students had opinions on the teaching factor. Was at a high level, with an average of 4.35. Graduate students had an opinion on the teacher factor. Is at a high level, with an average of 4.38.

2.2 Opinions on the learner factor It was found that undergraduate students and graduate students had opinions on the learner factor. is at a high level with an average of 4.28, the same.

2.3 Opinions on the information literacy teaching curriculum factors It was found that undergraduate students had opinions on the information literacy teaching curriculum factors. Was at a high level, with an average of 4.33. Graduate students had opinions on the factors of the information literacy teaching curriculum. Is at a high level, with an average of 4.38.

2.4 Opinions on information technology factors It was found that undergraduate students had opinions towards information technology factors were at a high level, with an average of 4.32.

The information technology factor was high, with an average of 4.24, as shown in Table 1.

**Table 1. Level of opinions of undergraduate students and graduate students on various factors that promote online information literacy teaching**

No.	Various factors	Undergraduate			Graduate		
		Average	S.D.	interpret	Average	S.D.	interpret
1	Instructor	4.35	.656	more	4.38	.457	more
2	student	4.28	.534	more	4.28	.396	more
3	Information literacy teaching curriculum	4.33	.653	more	4.38	.558	more
4	information technology	4.32	.506	more	4.24	.378	more
	SUM	4.32	.555	มาก	more	.410	more

### 3. Opinions of undergraduate and graduate students towards the problems and obstacles in online teaching information literacy

The results showed that Undergraduate and graduate students Had opinions on the problems and obstacles in teaching information literacy online. Overall, all four aspects were at a moderate level, with an average of 3.39, and could summarize their opinions on problems and obstacles in teaching information literacy. The online formats in each area are as follows:

3.1 Opinions on problems and obstacles in terms of teaching: It was found that undergraduate students had the opinions towards Problems and obstacles in teaching were at a low level, with an average of 2.47, and graduate students' views towards.

Teacher problems and obstacles are at a low level, with an average of 2.46

3.2 Opinions on student problems and obstacles It was found that undergraduate students had opinions towards.

Problems and barriers for students at the moderate level with an average of 2.58, and graduate students have opinions on issues and obstacles on students at a moderate level with an average of 2.56.

3.3 Opinions about the problems and obstacles in the information literacy teaching curriculum It was found that undergraduate students had an opinion on the problems and obstacles in the information literacy teaching curriculum at a high level, with an average of 4.25, and graduate students had an average of 4.25. Opinions on problems and obstacles in information literacy teaching curriculum are at a high level, with an average of 4.32.

3.4 Opinions on problems and obstacles in information technology It was found that ideas about problems and obstacles in information technology were at a high level, with an average of 4.26, and

graduate students had opinions on problems and obstacles in information technology. It was at a high level, with an average of 4.21, as shown in Table 2.

**Table 2. Levels of opinions of undergraduate students and graduate students - problems and obstacles in teaching information literacy online**

No.	Various factors	Undergraduate			Graduate		
		Average	S.D.	interpret	Average	S.D.	interpret
1	Instructor	2.47	.692	less	2.46	.927	less
2	student	2.58	.730	Medium	2.56	.910	Medium
3	Information literacy teaching curriculum	4.25	.584	more	4.32	.430	more
4	information technology	4.26	.525	more	4.21	.426	more
	SUM	3.39	.396	Medium	3.39	.490	Medium

#### 4. The relationship between factors promoting online information literacy teaching for undergraduate students and graduate students and problems and obstacles in promoting online information literacy

The results showed that Factors promoting online information literacy teaching for undergraduate students and problems and obstacles in promoting online information literacy All factors were positively correlated. With statistical significance at the 0.05 level and factors promoting online information literacy teaching for graduate students and problems and obstacles in promoting online information literacy, All factors were positively correlated. Statistically significant at the 0.05 level, as shown in Table 3.

**Table 3. The level of relationship between factors promoting online information literacy teaching and problems and obstacles in promoting online information literacy**

No.	Factor	Undergraduate			Graduate		
		Problems and Obstacles in promoting online information literacy			Problems and Obstacles in promoting online information literacy		
		Pearson Correlation	P-Value (2-tailed)	Relationship level	Pearson Correlation	P-Value (2-tailed)	Relationship level
1	Instructor	0.02	0.76	very low relationship	1.00**	0.00	High relationship
2	student	0.00	0.96	very low relationship	0.18	0.29	very low relationship
3	Information literacy teaching curriculum	0.87**	0.00	High relationship	1.00**	0.00	High relationship
4	information technology	0.01	0.80	very low relationship	1.00**	0.00	High relationship

#### 5. Summary of research hypothesis testing results

From Table 3, the results of the research hypothesis testing can be summarized as follows:



5.1 Teacher factors were related to problems and obstacles in promoting online information literacy. Of undergraduate students is very low.

5.2 Teacher factors were related to problems and obstacles in promoting online information literacy. Of graduate students at a high level

5.3 Learner factor. There was a correlation between the problems and obstacles in promoting online information literacy. Of undergraduate students is very low.

5.4 Learner Factors. There was a correlation between the problems and obstacles in promoting online information literacy. Of graduate students is very low.

5.5 Curriculum Factors for Teaching Information Literacy. There was a correlation between the problems and obstacles in promoting online information literacy. Of undergraduate students at the high level.

5.6 Curriculum Factors for Teaching Information Literacy. There was a correlation between the problems and obstacles in promoting online information literacy. Of graduate students at a high level

5.7 Information Technology Factors. There was a correlation between the problems and obstacles in promoting online information literacy. Of undergraduate students is very low.

5.8 Information Technology Factors. There was a correlation between the problems and obstacles in promoting online information literacy. Of graduate students at a high level.

## 6. Factors promoting online information literacy teaching for undergraduate students using multiple regression analysis statistics by importing all variables with independent and control variables

The research results revealed that the factors promoting online information literacy teaching for undergraduate students consisted of 4 aspects: the teacher factor, learner factor, Curriculum factors for information literacy teaching, and information technology factors. There was a statistical significance at the 0.05 level with a forecasting coefficient (R) of 0.997 and an adjusted forecasting coefficient (R Square) of 0.993. While gender, status, and experience did not influence teaching promotion. Online information literacy for undergraduate students There was no statistical significance at the 0.05 level, as shown in Table 4.

**Table 4. Factors promoting online information literacy teaching for undergraduate students using multiple regression analysis using all input methods with independent and control variable**

factor	B	S.E.	Beta	T	P-Value
constant	4.371	0.139		31.554	0.000
1. Gender	-0.089	0.058	-0.078	-1.531	0.127
2. Status	0.064	0.063	0.052	1.021	0.308
3. Experience	0.004	0.017	0.011	0.224	0.823
4. Instructor	0.265	0.010	0.314	26.636	0.000**
5. Learners	0.434	0.008	0.417	51.762	0.000**
6. The curriculum for teaching information knowledge	0.270	0.010	0.317	26.787	0.000**
7. Information technology	1.027	0.020	0.935	51.548	0.000**

\*\* Statistically significant at the level of 0.05, R = 0.997, R Square = 0.993

## 7. Factors promoting online information literacy teaching for graduate students using multiple regression analysis statistics by importing all variables with independent and control variables

The research results revealed that there were four factors promoting online information literacy teaching for graduate students. Learner factor Curriculum factors for information literacy teaching and information technology factors There was a statistical significance at the 0.05 level with a forecasting coefficient (R) of 0.994 and an adjusted forecasting coefficient (R Square) of 0.988. At the same time, gender, status, and experience did not influence teaching promotion. Online information literacy for graduate students Faculty of Agro-Industry Chiang Mai University There was no statistical significance at the 0.05 level, as shown in Table 5.

**Table 5. Factors promoting online information literacy teaching for graduate students statistical analysis of multiple regression using all input methods with independent and control variables**

factor	B	S.E.	Beta	T	P-Value
constant	4.457	0.303		14.732	0.000
1. Gender	0.238	0.135	0.293	1.770	0.086
2. Status	-0.126	0.138	-0.144	-0.910	0.369
3. Experience	-0.069	0.039	-0.296	-1.786	0.083
4. Instructor	0.297	0.031	0.331	9.660	0.000**
5. Learners	0.345	0.031	0.333	11.156	0.000**
6. The curriculum for teaching information knowledge	0.308	0.024	0.419	12.926	0.000**
7. Information technology	1.007	0.068	0.927	14.852	0.000**

\*\* Statistically significant at the level of 0.05, R = 0.994, R Square = 0.988

## 8. Opinions and suggestions on promoting information literacy online

The respondents provided research suggestions, divided into four aspects as follows:

8.1 Suggestions for teachers. The respondents gave suggestions that Libraries should promote or publicize the need for information literacy. Or encourage students to see the importance of information literacy for future work. And should increase the channel and frequency of advertising online information literacy courses. Let students know more For organizing activities to promote information literacy, libraries should provide training information. Things to prepare before training Remind the date and time of the training one day in advance so as not to forget. And there should be additional activities during the training to gain more understanding.

8.2 Suggestions for learners. The respondents suggested that Learners must have the basics of searching for basic information before training. Attend the training on time so that other learners do not wait. and should prepare the program or the internet to be ready before the training.

8.3 Recommendations for information literacy teaching curriculum the respondents suggested that Training courses should be included. Integrated into the seminar process and introductory research subjects of the Faculty. There should be more training topics related to disseminating research results / statistical analysis for research / searching for information from Open Access, and should increase the duration of the training. During non-office hours and on weekends.

8.4 Information Technology Recommendations. The respondents gave suggestions that practical online training Students must prepare two computers or have accessories for convenience in viewing

the screen and practicing simultaneously. And agree that the library organizes training using the Zoom program because it is used regularly. And like to record training and send retrospective videos to study.

## **DISCUSSION**

The results can be discussed as follows:

The respondents had the opinion that the factors that promote online information literacy teaching were effective in four aspects: teachers, learners, and information literacy curriculum. and information technology is important at a high level. Both groups of respondents had the same opinion. As a result of the statistics that have been analyzed, it was found that Teacher factors and information literacy curriculum factors It is the factor that will promote the most effective teaching of information literacy online. Undergraduate students and graduate students saw that it was a factor at a high level (overall, mean 4.35). It was found that it was a factor at a high level (overall, mean 4.38). If analyzed in subtopics, it was found that the most essential skills of teaching librarians must be in 3 levels: 1) teaching librarians must have skills, 2) teaching librarians must have the skills and techniques of searching for information for learning and research, and 3) The librarians have the integration of information skills in the research. teaching various subjects such as seminars, research subjects, etc., so that students can practice their skills in information literacy regularly. Regarding the factors of curriculum teaching information literacy, it was found that the first three most important courses and contents in teaching information literacy were: of the Faculty of Agro-Industry It is a factor that promotes teaching. Of the Faculty of Agro-Industry, and 3) the content is always up-to-date Changes or new information are presented. Of various online databases. This is consistent with the results of a study by Lanning and Mallek (2017), who studied factors influencing the information literacy competencies of Southern Utah University students. Library support staff, including the ratio of learners to librarians is a factor that greatly influences the information literacy performance of students. This is in line with research by Mutula et al. (2006), who found that teaching information literacy online will improve students' information skills more than face-to-face teaching.

In addition, Leenarach and Thongchai (2014) research has studied information literacy levels and the development of teaching and learning model proposals to promote the information literacy skills of undergraduate students. The Faculty of Humanities at Chiang Mai University discussed the importance of curriculum factors. The research results showed that The information literacy curriculum should define the type of information literacy skills process as a primary subject. Or should it be taught as a compulsory subject? A proposal for teaching and learning in developing information literacy skills for undergraduate students in 2 forms: 1) a course-based teaching approach, and 2) a teaching-based approach in the form of intervention in different subject processes. Including guidelines for cooperation with libraries at Chiang Mai University so that students' information literacy is sustainable, leading to lifelong learning. It is in line with the research of Korsanthia (2013) that found that the first three factors that promote effective online information literacy teaching are: know the information Librarians are responsible for teaching information literacy or co-teaching integrated literacy in the curriculum of subjects such as research subjects. Knowledge about the integration of information literacy into learning.

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# Curriculum Development for Teacher Librarians at Loei Rajabhat University: Advantages, Challenges, and Recommendations for a Dual-Major in Library Science and English

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## ABSTRACT

The Library and Information Science program at Loei Rajabhat University in Thailand transitioned from a B.A. to a B.Ed. degree with dual majors in Library Science and English to address declining enrollment and changing educational demands. The study examines the curriculum development milestones, economic benefits for students, challenges in proficiency levels, and initiatives to address them. To ensure sustainability, the article suggests improving language support, creating a holistic learning environment, and providing professional development opportunities.

**Keywords:** Dual-major program, Teacher librarian, Curriculum development, Library and information science, English

## INTRODUCTION

Loei Province, located in the upper northeastern region of Thailand approximately 520 kilometers from Bangkok, is geographically characterized by its mountainous terrain and shares a border with Xayaburi province in Lao PDR, with the Hueang and Mekong Rivers serving as natural dividers between the two regions (Loei Provincial Statistical Office, 2020). The establishment of Loei Rajabhat University (LRU), formerly known as "Loei Teacher's College," took place in 1973 on the outskirts of downtown Loei. It was during the mid-1980s that the university introduced Bachelor of Arts programs, thereby initiating the provision of library education at the institution. (Loei Rajabhat University, LRU, 2023).

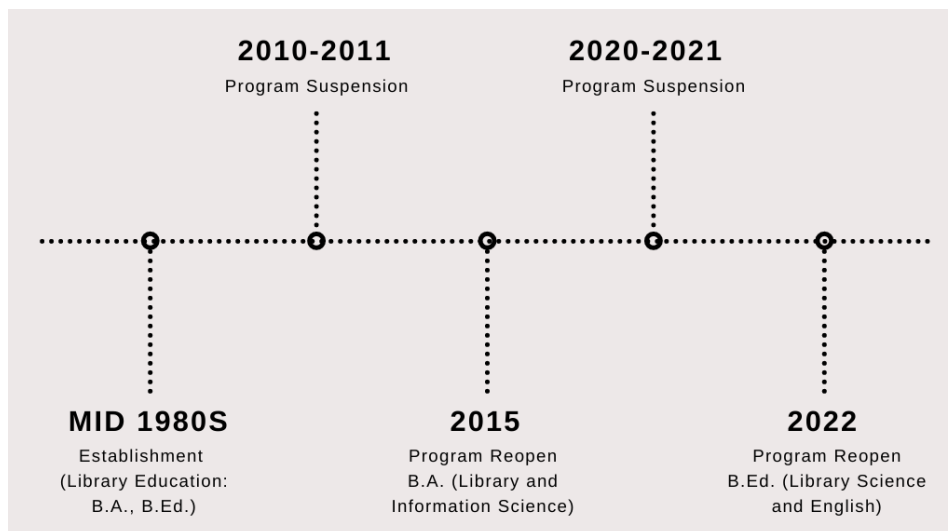
Traditionally, Library Science has been offered as a Bachelor of Arts degree. However, a significant change occurred in 2022 with the revision of the curriculum, introducing a four-year teacher training program that allows students to pursue double majors in Library Science and English. Under this new program, students will earn degrees in Education and will be qualified to teach both English and Library Science upon graduation.

To gain a comprehensive understanding of the present curriculum development, it is necessary to delve into the overall history of the curriculum since its inception. Based on interviews conducted with lecturers of the program, the following paragraphs will outline the significant milestones in the curriculum's journey (N. Ajanathorn, et al., personal communication, May 23, 2023).

The program experienced a significant transformation due to a continuous decline in student enrollment, which served as the main driving factor. When the program was initially established in the mid-1980s, it gained popularity and remained successful for nearly two decades. During its early years, the program offered two parallel paths for students: one leading to a Bachelor of Arts degree in Library Science for aspiring librarians, and the other leading to a Bachelor of Education degree in Library Science. The program thrived, and the number of lecturers had to be increased from three to five in order to handle the teaching workload. However, the program encountered difficulties as student enrollment saw a significant decline since 2007. Furthermore, changes in staff roles brought about uncertainty for both the program and the administration. Consequently, the program was temporarily suspended between 2010 and 2011, during which time the staff focused on teaching general subject in information for study and research. Additionally, they worked on developing a new curriculum to prepare for the program's reopening in 2012 and to attract new student enrollments.

The updated curriculum introduced a Bachelor of Arts in Library and Information Science, incorporating technology applications into the program. Additionally, a new generation of staff members specializing in information science were recruited to complement the traditional library education. This revised program was implemented from 2012 to 2016. However, despite these efforts, the continuous decline in student numbers posed a significant threat to the program's sustainability. Furthermore, the university's policy further hindered the program's survival. For instance, in 2015, the program attracted only 14 students, but it was forced to close as the university mandated a minimum enrollment of 20 students for any program to continue operating.

The crisis persisted, with slow response from program administrators leading to difficulties in attracting students in 2016. The university, recognizing the overall decline in student numbers, organized an "Open House" event to promote its programs to potential students. However, there was minimal interest shown in this particular program, prompting our staff to make persuasive efforts at the event. As a result, a total of 9 students enrolled for the academic year of 2016. Although the university allowed the program to continue for that year, the situation worsened when only 5 students enrolled in 2017. The university then convinced those students to switch majors, placing the program in serious jeopardy. In response, the staff held intensive meetings and made a decision to significantly improve the program by transforming it into a double-major degree in education, as mentioned earlier in this article. It took approximately three years to develop this new direction, and it was finally ready to admit its first batch of students in 2021.



**Fig. 1. Milestones of Library and Information Science Program, LRU**  
 (adapted from N. Ajanathorn, et al., personal communication, May 23, 2023)

### Transitioning to a Dual-Major Program in Librarianship

The program's transformation was initiated following a conference titled "The Production of Teacher Librarians Based on the National Standards of Teaching Profession towards International (In Thai)." The conference, organized by the Information and Library Science Program at Suratthani Rajabhat University in collaboration with the Thai Library Association (TLA), took place from January 31st to February 2nd, 2019. During this event, two staff members from the Library and Information Science program at LRU attended and were inspired by a new idea for curriculum development. After extensive brainstorming and voting, the LRU team made the challenging decision to shift the program from offering a Bachelor of Arts (B.A.) degree to a Bachelor of Education (B.Ed.) degree. This decision involved thorough research on teaching professional standards, regulations, and administrative considerations at LRU. The staff members were motivated by the concept of offering a dual-major degree to ensure the program's survival. Selecting the appropriate major to merge with library and information science was a crucial aspect. After careful consideration, English emerged as the ideal choice, as it had always been a popular major among students in LRU's educational faculty. Furthermore, the university's executives recognized the benefits of English skills for the new generation of Rajabhat students. The availability of qualified staff members to facilitate the dual-major further solidified the decision. Consequently, the program was finalized as a Bachelor of Education (Dual-major in Library Science and English), commencing in the academic year 2022.

Ensuring the program's sustainability involves more than just redesigning the curriculum and changing the degree name; it also entails considering the needs of stakeholders. While there is consistently high demand for English teachers, the situation differs for teacher librarians, as there are fewer available positions in comparison. This is likely due to the fact that library subjects are not typically considered primary subjects in schools, unless certain schools prioritize subjects like independent study, which require strong information navigation, evaluation, and presentation skills. Therefore, the program takes into account various factors suggested by stakeholders, which will be explored in the upcoming paragraphs.

According to the information collected as part of the annual quality assurance preparation, the results consistently showed positive outcomes for graduates of the B.A. in Library and Information

Science program at Loei Rajabhat University, covering the period from 2017 to 2020 (Loei Rajabhat University, Library Science and Information Science Program, 2017-2020). These graduates were successful in securing desired positions as librarians or teacher librarians in various educational institutions, including colleges and non-formal education libraries. Some graduates initially worked as school assistants, undertaking library tasks or assisting with other subjects, as a means to gain teaching experience and familiarity with the educational system before pursuing teaching certification to become qualified teachers.

The program's staff members were well aware of this trend and identified it as a key driver behind the decision to offer a direct education degree. This was done to ensure that future graduates would be adequately prepared and qualified for teaching positions. Additionally, the surveys revealed another significant factor: the influence of family values on students' career choices. Teaching, being a secure government job, received strong support from parents, leading many graduates to agree with this suggestion and pursue a career in teaching.

The program's lack of promotion has significantly contributed to the decline in potential student enrollment over the past decade. Diagram 1 illustrates two notable periods when the program had to be suspended due to low or no student enrollment. However, the program's administrators did not react promptly enough to actively promote the program, resulting in a continuous decline in the number of potential students.

Prior to the 2010-2011 suspension, the program passively relied on the university's enrollment system and underestimated the importance of public communication about the program. Despite attracting some students upon its reopening in 2015, this increase was short-lived, leading to another suspension. Various factors may have contributed to the declining number of university students, such as a low birth rate or increased competition from other universities, colleges, and professional institutions offering post-school options.

Informal interviews with school consultant teachers during program roadshows (conducted in 2018-2019 before the COVID-19 pandemic) revealed that the younger generations are unfamiliar with the concept of library and information science. They have developed a fear of the stereotypical image of a librarian wearing glasses and closely monitoring their activities in the library. This perception has discouraged them from considering the program as a viable option.

The current curriculum, revised in 2022, aims to develop highly skilled librarian professionals who possess strong English language proficiency, and conversely, to enhance English skills through the study of library and information science. Additionally, the program provides diverse career opportunities in the 21st century that emphasize both English and information literacy skills, thereby opening up broader career paths for future graduates. To enhance awareness and understanding of the program, the program staff members have actively engaged in communication efforts during roadshows, where they interact with students and teachers to provide information. Additionally, they have embraced social media platforms as a means to effectively reach out to potential students and engage in ongoing communication. The goal is to foster a deeper comprehension of the program's study concept and attract an increasing number of potential students.

## **REFLECTION ON THE CURRENT PROGRAM AND DISCUSSION**

The implementation of a dual-major program in Library Science and English is aimed at producing graduates who possess the necessary skills for teaching positions. Ongoing efforts are being made to promote the program and raise awareness among students and educators. However, after two years of operating the program, there are advantages and disadvantages that the program wishes to address.



## **Advantages**

While it is currently the only dual-major program in education at Loei Rajabhat University (LRU), the concept is not entirely new. Several other universities have already adopted similar approaches. For example, Rajabhat Maha Sarakham University has been offering a program in Library Education and English since 2014, and Uttaradit Rajabhat University has a program in Guidance Psychology and Library since 2019. The current trend in curriculum design brings clear benefits to students in terms of their economic investment in education. By pursuing a double major, students can maximize their time spent studying while increasing their job prospects after graduation. Moreover, a study conducted in Lao PDR by Phetsinorath and Chamnivickorn (2021) explores the impact of double majors on individual earnings. The findings indicate that individuals with a double major in social science or education at the college or university level show statistically significant improvements in their earning outcomes. This suggests that certain combination of two single majors can positively influence future earning potential.

In addition to the students' benefits, it is essential for the program's staff members to remain active and continuously engage in self-development. The new curriculum places emphasis on the application of digital technologies, particularly in subjects that involve community projects and the management of local information sources. The integration of technology is crucial for effectively managing and presenting these sources. Therefore, senior lecturers, who are experts in these subjects, should adopt a "Learn, Unlearn, and Relearn" mindset to adapt their skills to align with the concept of 21st-century learning. Research conducted by Bedford (2015) suggests that while there is evidence of learning and relearning in teaching methods, there is a lack of focus on unlearning practices in curriculum development and research. This highlights the importance of fostering a culture of continuous learning and adaptation to stay competitive in the knowledge economy.

Furthermore, it is imperative for the younger generation of staff members to continuously enhance their technological skills. In today's fast-paced world, technology evolves rapidly, and staying updated is essential to provide students with new ideas and techniques that can enhance their learning experiences. By embracing the latest technological advancements, these staff members can effectively engage and stimulate students' interest in their studies. This proactive approach not only ensures that the program remains relevant and in tune with the needs of the students but also fosters a dynamic and innovative learning environment. As technology continues to shape the educational landscape, the younger generation staff's ability to leverage and incorporate these advancements will greatly contribute to the program's success and the overall development of the students.

## **Disadvantage**

One significant challenge identified in the program after the initial years of implementing the new curriculum is the difficulty in producing students who are proficient in both subjects. The current cohort of students in the program comprises individuals with varying levels of motivation and proficiency in library and information science and English. Some students exhibit a strong interest in library and information science but struggle with English, while others possess moderate English skills and are interested in expanding their knowledge of library and information science.

Given that the program is taught in the Thai language, there are no concerns regarding the students' understanding of library and information science concepts. However, compared to students pursuing a single major in English, many students in the dual-major program face challenges in developing their English proficiency. This discrepancy in language skills poses a hurdle for these students as they strive to excel in both subjects simultaneously.

Addressing the language barrier and enhancing students' English language abilities requires careful attention from the program's staff members, who have already taken steps to provide comprehensive language support. Various activities and initiatives have been implemented, including English grammar and structure trainings, TOEIC preparation sessions, and dedicated meeting hours with foreign teachers. These efforts aim to create a conducive learning environment that fosters English language development and equips students with the necessary linguistic skills to succeed in both Library Science and English. By actively engaging in these activities, students not only enhance their overall language proficiency but also gain confidence and competence in using English within the context of library and information science.

In May 2023, one of our sophomore students was selected to join a month-long English summer course program in the Philippines as a result of their participation in rigorous English training sessions. This opportunity further highlights the program's commitment to enhancing students' English language proficiency and providing them with valuable international learning experiences.

Furthermore, it is important to note that the program is currently undergoing a curriculum revision process aligned with the principles of Outcome-based Education (OBE). This revision specifically caters to the unique needs of the dual-major program in Library Science and English. By embracing the OBE framework, the program strives to develop an educational approach that effectively caters to students pursuing both Library Science and English. OBE's emphasis on practical application enables students to engage in experiential learning, bridging theory with real-world contexts. Additionally, the student-centered nature of OBE accommodates diverse levels of proficiency and interests, facilitating personalized learning experiences.

As part of the OBE implementation, the program has established yearly expected learning outcomes (YLOs) to monitor and assess learners' progress. These YLOs serve as a visual representation of students' advancement, ensuring that the annual learning outcomes align with the overarching goals of OBE. By defining and evaluating these outcomes on a yearly basis, the program can ensure quality assurance and uphold educational objectives as outlined in the designated annual plan. Through the integration of YLOs and adherence to the OBE framework, the program strives to maintain a robust and effective curriculum that meets the evolving needs of learners and fosters academic excellence in the fields of Library Science and English.

## **CONCLUSION**

The reflection on the current program in Library Science and English reveals both advantages and challenges. On the positive side, the introduction of a dual-major program offers students economic benefits by combining two fields of study within the same timeframe, while also providing more job opportunities upon graduation. Additionally, the program aligns with existing models implemented by other universities, further supporting its effectiveness. However, one notable challenge is the varying levels of proficiency among students in both subjects, with some excelling in library science but lacking English skills, and vice versa. To address this, the program has implemented various activities and initiatives, such as English grammar and structure trainings, TOEIC preparation, and interactions with foreign teachers for improved communication skills.

## **SUGGESTIONS**

When formulating a curriculum that incorporates both Library Science and English as dual majors or vice versa, it is imperative to take the following suggestions into account:

- **Improving English Language Proficiency:** It is important for the program to enhance its support for English language learning for the students. This can be achieved through various initiatives such as offering extensive language training, facilitating conversation practice, and providing immersive learning opportunities. Additionally, establishing partnerships with international networks can enable student exchanges, allowing them to gain valuable experience in developing their English language skills. These efforts will effectively address the language barrier and contribute to students' overall language proficiency.
- **Creating a Holistic Learning Environment:** The program can enhance the learning experience by implementing individualized learning plans that cater to students' varying proficiency levels. Additionally, fostering collaborative learning opportunities where students with different strengths collaborate and learn from each other can further enrich their educational journey.
- **Continuous Professional Development for Staff:** Program staff members should continue their professional development, keeping up with advancements in both library science and English language teaching. This ensures that they can effectively support students and deliver up-to-date content.
- **Enhancing Learning and Collaboration through Educational Networks:** Developing collaborative networks with other universities and implementing educational activities aimed at facilitating learning and cooperation, such as camps or inter-university competitions focused on English language skills, contribute to the cultivation of self-confidence and enhance the visibility of the field of study.
- **Implementing a "one teacher librarian per school" policy in educational institutions:** In the context of national policy implementation, the Ministry of Education holds a pivotal responsibility in recognizing the significance of teacher librarians as key individuals who contribute to students' learning, facilitate collaboration among subject teachers, and foster fundamental literacy. Therefore, implementing a "one teacher librarian per school" policy is crucial for enhancing the quality of education and promoting information literacy. Having a dedicated teacher librarian ensures access to a well-equipped library, fosters collaboration among teachers, and provides guidance to students and teachers. This policy demonstrates a commitment to educational excellence and creates a vibrant learning environment.

By implementing these suggestions, the program can further enhance the learning experience and address the challenges associated with the dual-major curriculum. It will enable students to develop proficiency in both subjects and prepare them for successful careers in teaching and library science.

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# **Perception of Librarianship as a Profession, Level of Competency and Competitive Behavior of Filipino Librarians in the Middle East**

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## **ABSTRACT**

This study was anchored on the Competence Theory by Harter which states that success or mastery of a task can lead to an overall increase in the perception of one's own competence. It demonstrated how the concept of competence has come to prominence in the international discourse on education in recent years. The paper aimed to determine the perception of librarianship as a profession, level of competency and competitive behavior of Filipino librarians in Middle East. The authors used the descriptive-correlational research design to describe and measure the relationship of the variables under investigation. Thirty eight (38) Filipino librarians working in the Middle East were the primary sources of data. Random sampling was also used in this study. The salient findings: 1. The respondents perception of librarianship as a profession is "very positive". 2. The respondents' level of competency in managing information resources; managing information services; information technology and information organization was "very high ". 3. The respondents' level of competitive behavior was "very high". 4. There was a significant relationship between the respondents' level of perception of librarianship as profession and level of competency in librarianship. 5. There was a significant relationship between the respondents' level of competency and their level of competitive behavior in librarianship. 6. There was a significant relationship between the respondents' perception of librarianship as a profession and level of competitive behavior in librarianship. Conclusions: Filipino librarians in the Middle East showed a very positive perception of librarianship as a profession, with very high level of competencies.

**Keywords:** Librarianship, Level of competency, Competitive behavior, Perception, Descriptive correlation, Filipino librarian

## **INTRODUCTION**

The library is the evidence of an institution for the higher standard of education. It is one of the requirements for quality of an effective institution, it is reflected in the kind of library it has. Librarianship on the other hand is a profession concerned with acquiring and organizing collections of books and related materials in libraries and servicing readers and others with these resources with appropriate skills and competencies. In today's ever-changing and increasingly challenging

environment, well-designed and implemented core competencies enable libraries and library staffs to best meet the needs of the tough user community. Taking the professional competency one step further, you can use the results of your evaluation to identify in what competencies individuals need additional development or training. This will help you focus your training needs on the goals of the position and company and help your employees develop toward the ultimate success of the organization (Mahesh, 2019).

Aside from traditional skills such as cataloging and classification; indexing and abstracting; and library management, non-traditional competencies such as communication skills, advocacy skills, teaching skills, and technological skills were revealed to be vital competencies (Santos, 2018). Today's increasingly global marketplace is resulting in more organizations sending employees to work outside their home countries as expatriates. Consequently, identifying factors influencing expatriates' cross-cultural adjustment at work and performance has become an increasingly important issue for both researchers and firms (Setti, Sommovigo & Argentero, 2020). Based on the literature readings, it is notable that there are limited studies conducted particularly on the perception of librarianship, level of competency and competitive behavior among librarians working in the Middle East. Thus, the authors, aimed to determine the Filipino librarians' perception of librarianship as a profession, their level of competency and their competitive behavior.

This study was anchored on the Competence Theory by Harter which states that success or mastery of a task can lead to an overall increase in the perception of one's own competence. As cited by Glaesser (2018) in his study that demonstrated how the concept of competence has come to prominence in the international discourse on education in recent years.

The paper aimed to determine the perception of librarianship as a profession, the level of competency, and the competitive behavior of Filipino librarians in the Middle East. Specifically, this study sought to answer the following questions:

1. What is the respondent's perception of librarianship as a profession?
2. What is the respondent's level of competency in librarianship?
3. What is the respondent's level of competitive behavior in librarianship?
4. Is there a significant relationship between the respondent's perception of librarianship as a profession and their level of competency?
5. Is there a significant relationship between the respondent's level of perception of librarianship as a profession and their level of competitive behavior?
6. Is there a significant relationship between the respondent's level of competency and their level of competitive behavior?

## **LITERATURE REVIEW**

### **Starting a Career Abroad**

Today's increasingly global marketplace is resulting in more organizations sending employees to work outside their home countries as expatriates. Consequently, identifying factors influencing expatriates' cross-cultural adjustment at work and performance has become an increasingly important issue for both researchers and firms. (Setti, Sommovigo and Argentero, 2020). The 2018 statistical report of the Philippine Overseas Employment Administration (POEA) informs the reader of more than 1 million OFWs around the world (POEA, 2018a). Librarians however are no exemption as the data from POEA shows that 16 librarians from 2015-2020 are widely spread throughout the different regions of Gulf Cooperation Council (GCC) (POEA, 2018).

## **Perception of Librarianship as a profession**

Librarianship has been for a very long time a profession needing to adapt to a continually changing environment. Librarians in all settings and fields of expertise have been facing new challenges resulting from both internal and external factors. According to Ramadevi (2018) in the present scenario, information and communication technology plays a very important role. Due to the development of technology, internet has brought out some of the opportunities and challenges which provide the effective way of use the library information resources and services. Quadri (2018) examined the influence of career choice on professional and job commitment, factors influencing career choice, the perceptions on professionalization and the extent to which career choice has influenced the growth, job and professional commitment of librarians in selected libraries in Oyo and Ogun states of Nigeria.

Olukayode, Makinde, & Oketunji (2022) investigated how perceptions and IT competencies of academic librarians influenced their use of Cloud-Based Storage (CBS) systems in libraries in South-West Nigeria. The findings revealed that the librarians had high perceptions for the use of CBS systems and also their IT competencies were on the high side. The perceptions and IT competencies of librarians significantly influenced the use of CBS systems in Nigerian academic libraries.

## **Level of Competency**

Bajpai and Margam (2019) findings of the study revealed that the majority of the LIS professionals have basic knowledge of ICT skills to manage the libraries with the exception in some areas such as dealing with the operating system and software. Libraries are always considered as a non-profit organization and they need a proper organization and management (Anwar & Zhiwei, 2019). The present study has been taken into a grant to find out the skills and knowledge of academic librarians in the age of electronic. The result shows the LIS professionals still lacking some of the major skills, competencies, and knowledge regarding the future concern of library organization. This would suggest that the librarians should be equipped with all the related skills and knowledge to manage their library. Suwarno (2018) study about the attitudes of librarians in the modern era. The results of the study show that: (1) the librarians carry out their duties maximally; (2) the librarians maintain and enhance their competencies; (3) the librarians collaborate each other to enhance their professional competencies; (4) the librarians enrich their knowledge and professional development through trainings and workshops; and (5) the librarians organize trainings and workshops that are congruent with local wisdoms.

## **METHODOLOGY**

The authors used the descriptive-correlational research design to describe and measure the relationship of the variables under investigation. Empirical data was used in this study. Thirty-eight (38) Filipino librarians working in the Middle East were the primary sources of data. The content and construct validity of the survey instrument was assessed by a panel of experts in librarianship, research, and statistics. For reliability of the survey questionnaire using Cronbach Alpha: For perception: 0.923; for competency: 0.930; for competitive behavior: 0.877. Prior to the distribution of the questionnaires a letter of approval was sent to each participants asking their consent. The questionnaires were administered by the researchers via Google Forms to Filipino librarians currently working in different countries of the Middle East such as Qatar, Saudi Arabia, and UAE. The accomplished questionnaires were immediately retrieved by the researchers. All gathered data was tabulated and encoded using the Excel program and submitted to the statistician for the statistical treatment and analysis of data.

## RESULTS

**Table 1. Respondents' Perception of Librarianship as a Profession**

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Selection and acquisition of multi-media sources of information.	3.60	Very Positive	3.5
2. Cataloguing and classification of knowledge or sources of information into relevant organized collections.	3.70	Very Positive	1
3. Development of computer-assisted/computer-backed information systems.	3.51	Very Positive	7
4. Establishment of library systems and procedures.	3.68	Very Positive	2
5. Dissemination and rendering of information, reference and research assistance; archiving; and education of users;	3.60	Very Positive	3.5
6. Rendering of services involving technical knowledge/expertise in abstracting, indexing, cataloguing and classifying;	3.57	Very Positive	5.5
7. Preparation, evaluation or appraisal of plans and programs for the establishment and growth of libraries.	3.57	Very Positive	5.5
8. Provision of professional and consultancy services or advice on any aspect of librarianship	3.41	Very Positive	9
9. Organization, conservation, preservation and restoration of historical and cultural documents and other intellectual properties.	3.34	Very Positive	10
10. Teaching, lecturing and evaluating of libraries, archives and information centers.	3.47	Very Positive	8
<b>Average</b>	<b>3.55</b>	<b>Very Positive</b>	

The result contradicts Quadri (2018) study about the professionalization of librarianship. Findings revealed that the major perceptions of librarians about the professionalization of librarianship was poor as majority of the respondents indicates they hate being librarians. While it is in line with Ramadevi (2018) study where academic library staff has a high opinion as well as positive attitude on marketing of library resources and services.

**Table 2. Respondents' Level of Competency in Librarianship: Managing Information Resources**

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. I manage the process by which library resources are selected and acquired	3.62	Very High	1
2. I understand the general structure, relationships and relative importance of library catalog systems and software (Classification Systems, e.g. LC, Dewey; subject headings List; e.g. LCSH, AACR2; RDA)	3.57	Very High	2



3. I understand the acquisition and collection development processes and policies for the library	3.55	Very High	3
4. I use common social networking and online collaboration tools (e.g. blogs, podcasts, instant messaging tools, photo-sharing tools, web conferencing programs)	3.26	Very High	5
5. I understand preservation and conservation issues, including requirements for archival preservation and proper handling of materials	3.40	Very High	4
<b>Average</b>	<b>3.48</b>	<b>Very High</b>	

As reflected in Table 2, respondents' level of competency in librarianship in managing information resources was “very high” with an average weighted mean of 3.48. This implies that the respondents are highly skilled with the ability to manage information resources. Filipino Librarians in Middle East manage the process by which library resources are selected and acquired with a weighted mean of 3.62 (rank 1). They understand the general structure, relationships and relative importance of library catalog systems and software (Classification Systems, e.g. LC, Dewey; subject headings List; e.g. LCSH, AACR2; RDA) with a weighted mean of 3.57 (rank 2). They understand the acquisition and collection development processes and policies for the library with a weighted mean of 3.55 (rank 3). They understand preservation and conservation issues, including requirements for archival preservation and proper handling of materials with a weighted mean of 3.40 (rank 4). Respondents use common social networking and online collaboration tools (e.g. blogs, podcasts, instant messaging tools, photo-sharing tools, web conferencing programs) with a weighted mean of 3.26 (rank 5). IT is becoming a tool in modern academic libraries designed to facilitate library operations to meet the information needs of academic library clients. In light of this, library staff is obliged to be equipped with IT skills and competencies to assist the institution to achieve its objectives by supporting teaching, learning, and research.

The result is supported by the study of Dube (2020), IT is becoming a tool in modern academic libraries designed to facilitate library operations to meet the information needs of academic library clients. Library staff are obliged to be equipped with IT skills and competencies to assist the institution to achieve its objectives by supporting teaching, learning, and research.

**Table 3. Respondents’ Level of Competency in Librarianship: Managing Information Services**

<b>Indicators</b>	<b>Weighted Mean</b>	<b>Verbal Interpretation</b>	<b>Rank</b>
1. I understand and performs the basic operations of the circulation function.	3.66	Very High	2
2. I explain and performs intra and interlibrary loan procedures, document delivery, resources sharing, reserves and other information retrieval options.	3.57	Very High	4
3. I understand the essential characteristics of reference service in order to assist, advice and instruct users in the use of primary resources.	3.68	Very High	1
4. I develop and implements training programs to educate the library users on the use of the library and its resources.	3.60	Very High	3

5. I develop, design, implement and assess the library's information literacy program.	3.48	Very High	5
<b>Average</b>	<b>3.60</b>	<b>Very High</b>	

As shown in Table 3, the Filipino Librarians level of competency in managing information services in Middle East was “very high” with an average weighted mean of 3.60. This result indicates that they are highly capable of managing information services in Middle East libraries. Specifically, indicator 3 obtained 3.68 weighted mean (rank 1), “I understand the essential characteristics of reference service in order to assist, advice and instruct users in the use of primary resources.”. Indicator 1 obtained 3.66 weighted mean (rank 2), “I understand and performs the basic operations of the circulation function.”. Indicator 4 obtained 3.60 weighted mean (rank 3), “I develop and implements training programs to educate the library users on the use of the library and its resources.”. Indicator 2 obtained 3.57 weighted mean (rank 4), “I explain and performs intra and interlibrary loan procedures, document delivery, resources sharing, reserves and other information retrieval options.”. While indicator 5 obtained 3.48 weighted mean (rank 5), “I develop, design, implement and assess the library's information literacy program.”

The result is supported by the study of Bajpai and Margam (2019), findings of the study revealed that most of the LIS professionals have basic knowledge of ICT skills to manage the libraries with the exception in some areas such as dealing with the operating system and software.

As seen in Table 4, the average weighted mean of 3.58 revealed that respondents' level of competency in librarianship in managing information technology was “very high”. This means that Filipino Librarians in Middle East are knowledgeable in managing information technology used by their respective libraries. Specifically, respondents understand common security protocols related to internet use with 3.68 weighted mean (rank 1). They understand and use basic computer hardware and peripherals with 3.62 weighted mean (rank 2), perform basic functions of e-mail applications with weighted mean of 3.60 (rank 3). They perform basic calendar and task management operations/applications with weighted mean of 3.53 (rank 4), understand and perform basic operating system functions with weighted mean of 3.47 (rank 5).

**Table 4. Respondents' Level of Competency in Librarianship: Managing Information Technology**

<b>Indicators</b>	<b>Weighted Mean</b>	<b>Verbal Interpretation</b>	<b>Rank</b>
1. I perform basic functions of e-mail applications.	3.60	Very High	3
2. I perform basic calendar and task management operations/applications.	3.53	Very High	4
3. I understand and use basic computer hardware and peripherals.	3.62	Very High	2
4. I understand common security protocols related to internet use.	3.68	Very High	1
5. I understand and perform basic operating system functions.	3.47	Very High	5
<b>Average</b>	<b>3.58</b>	<b>Very High</b>	

Supported by the study of Hamad, Al-Fadel, & Fakhouri (2021) digital skills are necessary to work and manage electronic library infrastructures and services. The results indicate a high level of

digital skills among the librarians. Most importantly, the level of digital skills positively influences the librarians' acceptance and use of technology in academic libraries.

As reflected in Table 5, the respondents' level of competency in librarianship in managing information organization was "very high with an average weighted mean of 3.40. This means that respondents are highly skilled in establishing finance management, building harmonious relationships with the organization and forging linkages or partnership outside the organization. Specifically, respondent librarians forge linkages/partnerships, within and outside the organization, to optimize use of library resources, promote library cooperation initiatives and to ensure conformity with regulatory standards, laws and other policies affecting libraries with weighted mean of 3.60 (rank 1). They build effective and harmonious work relationship and personal growth of the people working within the organization with a weighted mean of 3.57 (rank 2). Establish effective financial management processes and services, using sound business and financial judgement with a weighted mean of 3.49 (rank 2). While indicator 1 and 4 level of competency was "high", where respondents employ sound project management principles and procedures in the planning and implementation of projects, programs and researches with weighted mean of 3.21 (rank 4) and envision strategic directions of the library in support of the programs of the institutions to which it is attached with weighted mean of 3.15 (rank 5).

**Table 5. Respondents' Level of Competency in Librarianship: Managing Information Organization**

<b>Indicators</b>	<b>Weighted Mean</b>	<b>Verbal Interpretation</b>	<b>Rank</b>
1. I envision strategic directions of the library in support of the programs of the institutions to which it is attached.	3.15	High	5
2. I establish effective financial management processes and services, using sound business and financial judgement.	3.49	Very High	3
3. I employ sound project management principles and procedures in the planning and implementation of projects, programs and researches	3.21	High	4
4. I build effective and harmonious work relationship and personal growth of the people working within the organization.	3.57	Very High	2
5. I forge linkages/partnerships, within and outside the organization, to optimize use of library resources, promote library cooperation initiatives and to ensure conformity with regulatory standards, laws and other policies affecting libraries.	3.60	Very High	1
<b>Average</b>	<b>3.40</b>	<b>Very High</b>	

The result is supported by Olise (2021), study that revealed that libraries organize their materials for research productivity to a large extent amidst the major challenges they encounter varying from lack of automation, poor funding to unavailability of technology.

**Table 6. Composite Table for the Respondents' Level of Competency in Librarianship**

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Managing information resources	3.48	Very High	3
2. Managing information services	3.60	Very High	1
3. Managing information technology	3.58	Very High	2
4. Managing information organization	3.40	Very High	4
<b>Overall Weighted Mean</b>	<b>3.52</b>	<b>Very High</b>	

The above composite table revealed that respondents' level of competency in librarianship was "very high" with an overall weighted mean of 3.52. It means that Filipino Librarian respondents in Middle East have the abilities and skills to perform their profession as Librarian. Specifically, managing information services obtained a weighted mean of 3.60 (rank 1), managing information technology obtained 3.58 weighted mean (rank 2), managing information resources obtained 3.48 weighted mean (rank 3), while managing information organization obtained 3.40 weighted mean (rank 4).

**Table 7. Relationship between the Respondents' Level of Competency and Level of Competitive Behavior in Librarianship**

Competencies	Pearson r	p-value	Interpretation
Managing information resources	0.768** Moderate correlation	0.000	Significant
Managing information services	0.826** High correlation	0.000	Significant
Managing information technology	0.641** Moderate correlation	0.000	Significant
Managing information organization	0.752** Moderate correlation	0.000	Significant
**Significant @ 0.01			

As shown in Table 7 for the relationship between the respondents' level of competency and level of competitive behavior in librarianship, a Pearson r value of 0.768 (Managing information resources), 0.826 (Managing information services), 0.641 (Managing information technology), and 0.752 (Managing information organization) was obtained. A p value of 0.000 which was lower than the 0.01 level of significance showed that there is a significant relationship between the respondents' level of competency and level of competitive behavior in librarianship. The higher is the level of respondents' competency, the higher is the level of competitive behavior in librarianship.

**Table 8. Relationship between the Respondents' Perception and Level of Competitive Behavior in Librarianship**

	<b>Pearson r</b>	<b>p-value</b>	<b>Interpretation</b>
Respondents' Perception and Level of Competitive Behavior in Librarianship	0.646** Moderate correlation	0.000	Significant
**Significant @ 0.01			

As presented in Table 8 for the relationship between the respondents' perception and level of competitive behavior in librarianship, a Pearson r value of 0.646 was obtained. A p value of 0.000 which was lower than the 0.01 level of significance showed that there is a significant relationship between the respondents' perception and level of competitive behavior in librarianship. The "very positive" perception of the respondents of librarianship as a profession, the higher is their level of competitive behavior. The result is supported by the study of Ramadevi (2018), academic library staff has a high opinion as well as a positive attitude toward marketing of library resources and services. Academic library staff are aware of marketing services which enable them to improve the services in terms of satisfying the users of library products and services.

## DISCUSSION

The respondents perception of librarianship as a profession is "very positive". Their level of competency in librarianship in managing information resources; managing information services; information technology and information organization was very high. Their level of competitive behavior in librarianship was also very high. There was a significant relationship between the respondents' level of perception of librarianship as profession and level of competency in librarianship. Results also revealed that there was a significant relationship between the respondents' level of competency and their level of competitive behavior in librarianship. A significant relationship between the respondents' perception of librarianship as a profession and level of competitive behavior in librarianship was noted. It can be concluded that Filipino librarians in the Middle East showed a very positive perception of librarianship as a profession; and with very high level of competency in managing information resources and services.

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# Information Need for Curriculum Management According to the AUN-QA Criteria

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## ABSTRACT

The objective of this study is to explore the information needs and information systems for curriculum management at the Faculty of Humanities and Social Sciences, Khon Kaen University, according to the AUN-QA criteria. The study utilizes qualitative research methods. The target groups consist of three groups of personnel related to curriculum management and quality assurance at the program level, totaling 52 individuals, including the faculty administrators, curriculum management committee members, and support staff. The research findings indicate that the data provided by all three groups, including administrators, faculty committee members, and support staff, are shared in various tasks, such as curriculum details and faculty and student information. The data usage is observed at different levels, including the administrators, committee members, and support staff, for academic, administrative, strategic, and research purposes. Challenges related to data redundancy and inconsistencies between the data stored in each department have been identified, highlighting the need for an information system that can integrate relevant data with other information systems to facilitate efficient curriculum management and ongoing quality assurance reporting.

**Keywords:** Information need, Curriculum information system, Curriculum administration, AUN-QA

## INTRODUCTION

Quality assurance in education is a system for quality control, quality audit, and quality assessment of education that aligns with the standards of educational management. Its purpose is to instill confidence in society that the curriculum is capable of developing knowledge and producing graduates that respond to the country's development strategies. Additionally, there are other important issues, such as the necessity for higher education institutions to provide information to the public, allowing stakeholders to participate in transparency and scrutiny, among others (Office of the Higher Education Commission, 2017).

In Thailand, the Internal Quality Assurance Committee at the university level has divided the quality assurance of education into three levels: program level, faculty level, and institutional level. Higher education institutions have the autonomy to choose an internal quality assurance system based on the principles of academic freedom and institutional autonomy. This may involve a system developed by the Internal Quality Assurance Committee at the university level or a system recognized

internationally that can ensure quality at the program, faculty, and institutional levels, such as the AUN-QA system or EdPEX system, among others (Internal Quality Assurance Committee at the university level, 2014).

Quality Assurance of the Curriculum according to the ASEAN University Network Quality Assurance (AUN-QA) Version 4.0 is a quality assurance criterion commonly used by Thailand and Asian educational institutions. AUN-QA has been developed and improved up to Version 4, which consists of 8 quality assessment criteria covering inputs, processes, and outputs. This requires a significant amount of information to be reported for quality evaluation, including details of the curriculum, structure, courses, curriculum coordinators, teaching and learning management, and various learning support systems (ASEAN University Network Quality Assurance : Guide to AUN-QA assessment at programme level version 4.0., 2020). Reporting on the curriculum's progress requires data and information from various relevant units, which often leads to challenges such as duplicate and outdated data, as well as non-systematic data management. Consequently, the process of preparing quality assurance reports often encounters difficulties and delays on an annual basis.

Addressing the aforementioned issues, the development of an information system for curriculum management, which is related to the quality assurance of the curriculum according to the ASEAN University Network Quality Assurance (AUN-QA) criteria, would help reduce problems of redundancy and outdated data. Additionally, it would save time in preparing quality assurance reports and reduce paper consumption.

To achieve a successful information system, it is essential to understand the user needed to support the curriculum quality assurance reporting. Thus, the researchers are interested in studying the information system requirements from stakeholders involved in the self-assessment reporting process at the curriculum level, following the AUN-QA criteria.

The outcome of this study will not only provide the faculty with the necessary information about the development of the information system for curriculum management, but it will also serve as a guideline for creating a user-friendly system that caters to the needs of faculty members and related personnel. The system should facilitate curriculum management and seamless integration of data with the quality assurance information system of the Faculty of Humanities and Social Sciences, thus enhancing the overall efficiency of the system.

## **OBJECTIVE**

To examine the information requirements for curriculum management from stakeholders involved in the self-assessment reporting process at the curriculum level, following the AUN-QA criteria.

## **RESEARCH METHODOLOGY**

This research is a qualitative study that utilizes document analysis and interviews with informant who involved in the curriculum quality assurance reporting of the Faculty of Humanities.

### **1) Key informants**

The researchers used purposive sampling method to select the key informants who were directly involved in the curriculum quality assurance reports. There were three groups in total, including:

1. **Administrators** who responsible for monitoring quality indicators related to the curriculum, such as the Vice Dean for Academic Affairs and Internationalization, the Assistant Vice



Dean for Academic Affairs and Internationalization, and the Vice Dean for Strategic Planning and Research. There are a total of 3 informants.

2. **Curriculum management committee**, including professors who are responsible for curriculum management or academic planning, control, monitoring, and organizing the data system related to teaching and learning management and its regular use. There are 21 curricula and a total of 21 key informants.

3. **Support staff** who are responsible for recording data and have been assigned by administrators and the curriculum management committee. They are divided into four main roles: management, strategic planning and research, student development and organizational communication, and academic affairs. There are 28 key informants.

## 2) Data Collection

Data collection for this research has been conducted in two parts:

1. **Document analysis:** The researcher searched and collected the data through books, manuals, and research works, both in printed materials and online documents. Relevant information aligned with the research objectives was selected, including concepts related to curriculum management, relevant laws and criteria for educational quality assurance and curriculum standards, theoretical perspectives on system development, research on information systems, curriculum management, and curriculum quality assurance.

2. **Interviewing:** 52 key informants were interviewed to gather data for the quality assurance report of the AUN-QA Version 4. The interviews aimed to obtain information on the data requirements for curriculum quality reporting, which would be used in the information system for curriculum management. The interviews were structured into three sections: (1) General information about the key informant, (2) Information system requirements for curriculum management regarding data and information used in curriculum management, and (3) Additional comments and suggestions.

**3) Data analysis.** The research findings were presented in a narrative format.

This research project has undergone ethical review and approval by the Research Ethics Committee at Khon Kaen University, with project number HE653278.

## RESEARCH FINDING

The study results on the information system requirements for curriculum management and quality reporting according to AUN-QA Version 4 will be presented in three parts based on the key informants, including:

- 1) Information system requirements of administrators.
- 2) Information system requirements of faculty members serving as curriculum management committees.
- 3) Information system requirements of supporting staff.

The details are as follows:

1) The information system requirements of the administrators are as follows:

Due to the administrators' need to ensure that the curriculum is of high quality and meets the standards, the information system should support the management of the curriculum, including aspects related to students, such as admissions numbers and graduation rates according to the curriculum structure. It should also facilitate the management of qualified and knowledgeable faculty members

based on their expertise. Emphasis should be placed on academic publications and personal development. The administrators emphasize the important goals of curriculum management, which are to internationalize the curriculum, produce graduates who meet the demands of the job market, and ensure that students have employment opportunities. The curriculum should foster collaboration with organizations and businesses, produce quality graduates, instill confidence in the graduates, and gain recognition from academics in the ASEAN region.

Furthermore, there should be a system for storing and providing information related to the curriculum, such as announcements, regulations, or requirements for curriculum development, curriculum improvement, and ensuring up-to-date and appropriate quality assurance at the curriculum level. This includes forms for curriculum improvement. Additionally, there should be a database of AUN assessor who registered with the Council of University Presidents of Thailand to facilitate the selection of evaluators for quality assessment of the curriculum.

**2) The information system requirements of the Curriculum Management Committee are as follows:**

The main objectives of curriculum management, as envisioned by the Curriculum Management Committee, include emphasizing standard criteria and quality assurance for the curriculum, developing learners in line with societal needs and desired graduate attributes specified by the curriculum and the university. It also involves creating collaborative networks in various forms and prioritizing feedback from students, alumni, and stakeholders. In line with these objectives, the data and information required by the Curriculum Management Committee have similarities to those used by the administrators. This includes information related to the academic positions and qualifications of teaching staff, roles or positions in each curriculum, as well as other attributes such as expertise, experience, various academic works, and training and development data of teachers.

The Curriculum Management Committee will utilize information and data regarding curriculum details and stakeholders such as current students, prospective students, alumni, teachers, and employers to manage the curriculum and report its quality. The Committee believes that the university already has various information systems supporting educational services, but these systems lack integration, leading to complexity and difficulty in managing curriculum-related operations.

Furthermore, curriculum administrators utilize information and data on the details of the Program specification to disseminate and promote the curriculum details to stakeholders, including interested students, school counsellors, students, and teachers through various channels. This information is also used for teaching and learning management in subjects and for preparing self-assessment reports at the curriculum level for internal quality assurance purposes each academic year.

Therefore, the information system requirements for curriculum management can be summarized into three points for Curriculum Management Committee:

- Linking data and information from the educational service information system of the faculty to facilitate convenient usage and curriculum management.
- Supporting data for the preparation of curriculum-level quality assurance reports each academic year.
- Providing information and data on the details of the curriculum that undergo changes and the current curriculum improvement process.

**3) The information system requirements of the support staff:**

The information system requirements for support staff focus on prioritizing convenience in terms of data service for service recipients, including teachers, students, and external stakeholders. This involves providing accurate and timely information in accordance with criteria and regulations.

Additionally, the curriculum should be able to utilize data from the support staff in various departments to efficiently manage the curriculum, including capacity planning and advancing into academic positions that demonstrate the academic and research potential of the teachers. However, the information and data used to support curriculum management by support staff may vary depending on the department they belong to.

For the Faculty of Humanities and Social Sciences, the support staff's work can be divided into four duties: administration, strategy and research, student development and Public relations, and academic affairs. Each group of support staff contributes data and information to help teachers achieve their curriculum management goals. The details are as follows:

- The administration department includes Human resources, and administrative support staff are groups that primarily support information related to teaching faculty. This includes information such as faculty profiles, further education, faculty retention, qualifications, educational qualifications, requests for academic positions, and appointments to curriculum improvement committees, among others. Additionally, these administrative staff members also play a role in supporting the organization of various project documents, such as budget disbursement documents, sending letters to qualified individuals, and facilitating training and development programs for faculty within the information system for reporting and evaluating curriculum quality. Each academic department may have distinct characteristics or different operational procedures within these tasks.

- The strategic planning and research department encompasses strategic planning, research, and digital technology groups. These groups are responsible for supporting fundamental data and information used in operational planning. They receive data connections from the human resources group and also support data related to learning support services provided in classrooms and various laboratories to meet the needs of both faculty and students. Additionally, this department supports information regarding systems and mechanisms for research support, academic publications, maintenance of faculty academic journals, and utilizes the aforementioned data to support curriculum management at both the program and faculty levels.

- The student development and corporate communication department supports data and information related to extracurricular activities of students, including both academic and non-academic activities. Additionally, they provide support for data on employer satisfaction among graduates and employment status of graduates, which are used as information for self-assessment reports of the curriculum to evaluate the quality of the program every year.

- The academic affairs department is responsible for supporting data and information in the following areas:

- 1) Curriculum management: This includes information related to courses, course structure, credit hours, study plans, and graduation requirements.

- 2) Student registration: This involves data on new student admissions and student completion.

- 3) Academic activities and student achievements: This encompasses activities such as internships, student training within the faculty, and academic accomplishments at the undergraduate, master's, and doctoral levels.

- 4) Faculty registration: This involves collecting academic works, published research, and information needed for the appointment of thesis defense committees. It also includes gathering form data related to the registration system and academic requests.

Additionally, the academic affairs department is responsible for overseeing international affairs, including data on memoranda of understanding (MOUs), services for international students, English

language certification, information on international students, job recruitment, and promotional activities. They also handle various necessary information for international students.

For the problems encountered by support personnel, the information and data system is not sufficient to facilitate effective curriculum management. The support staff requires a system that can assist in curriculum management, specifically the program specification. The system should display current and historical data publicly for the benefit of the curriculum, staff members, students, and interested individuals, allowing them to study and access information independently. This would reduce the need for staff to respond to inquiries and address issues, as users would be able to retrieve the information themselves from a database system. This would streamline the workflow of the staff members.

It is important to have user satisfaction data available for graduates, which should include retrospective data and be accessible to demonstrate trends from the past to the present. This information would be beneficial for the curriculum to be used in quality assurance and curriculum improvement. Additionally, there should be a database for recording faculty training and development, allowing teachers to enter and record data at any time. There should also be policies or incentives to motivate and encourage teachers to enter and record data as much as possible. Furthermore, it is essential to link and integrate this system with other relevant systems currently existing in the faculty.

## **DISCUSSION**

The study summarizes the information needs for quality management of the curriculum from three groups: administrators, faculty members holding positions or roles in curriculum management committees, and support staff. The study found that these groups collaborate and use shared data for various tasks, including curriculum details, faculty qualifications, and student/alumni information. This collaboration occurs at different levels, including top-level administrators, curriculum management committees, and support staff in academic, administrative, strategic, and research areas.

However, the separate data collection and storage by different units can lead to duplication and inconsistent information, causing confusion and inefficiencies in work processes. Therefore, developing an information system for curriculum management that can link related data with other existing information systems in the faculty would help reduce complexity, enhance convenience in work processes, and support effective curriculum management.

## **RESEARCH RECOMMENDATIONS**

Based on the study findings, it is evident that there is a significant amount of shared information across various departments. Therefore, in order to develop an information system for curriculum management in the Faculty of Humanities and Social Sciences at Khon Kaen University, it is recommended to analyze the data, information flow, and data utilization. This analysis will help in designing an information system that effectively supports work processes and reduces duplication in data storage and utilization.

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## **SECTION II**

### **INFORMATION AND LIBRARY SCIENCE RESEARCH**

# **Users Usage verses Satisfaction of Library Resources and Services in University Libraries: A Case Study of Jawaharlal Nehru Technological University, Kakinada. A.P. India**

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## **ABSTRACT**

The evaluation of library resources and services from the viewpoints of users is crucial since libraries are one of the key service-oriented organizations in academic institutions. It provides a prompt feedback for libraries to assess and improve their resources and services to users. The aim of this research paper was to measure the availability of resources and services with regard to satisfaction and usage performance of the postgraduate students of the Jawaharlal Nehru Technological University Library, Kakinada, Andhra Pradesh, India. The data was collected through questionnaire. A total 600 questionnaires were distributed to the respondents and 415 questionnaires were received indicating 69.14% response rate. The performance gap analysis was used to determine the satisfaction and usage pattern of available resources and services. The most important areas are satisfied by the postgraduate students was book lending service followed by reference service, IT base services, Internet and Intranet facility. Reprographic service, online journals, college website information, book lending service etc. are the largest gap between the satisfaction and usage performance. The findings of this study give a good insight to improve student's satisfaction providing a better service in identified areas.

**Keywords:** Usage pattern, Satisfaction level, Resources, Services, Gap analysis

## **INTRODUCTION**

Advances in Information Communication Technology (ICT) during the past few decades have brought radical changes in the way information is gathered, stored, organized, accessed, retrieved and consumed. Today's users have their information needs met via a number of options. They need not come physically to the library to use print formats but can stay at home or the office and access online library resources and services via networks or authentication methods at any time. In order to exploit the current information explosion, utilization of print and digital resources in the libraries for rapid development is necessary and important. Digital resources can be used for efficient retrieval and meeting information needs. The aim of this research was to measure the desired resources and services satisfaction and actual usage pattern of the users of the Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh. This is very important for academic libraries since most of them call for

more and more research work. This important fact is convincing many libraries to move towards digital resources, which are found to be less expensive and more useful for easy access. This type of study is essential to conduct user survey in order to improve the existing library services, plan new services, rationalize the limited financial resources in an economical way, evaluate the performance of the library and enhance the user satisfaction.

### **JNTUK: A Backdrop**

The Jawaharlal Nehru Technological University (JNTU) was originally 'The College of Engineering, Vizagpatnam' at the time of its establishment in 1964. It is now a sprawling campus of 110 acres, green with mango trees in the fast developing port city of Kakinada, East coast of peninsula India. Kakinada has a rich political literacy and cultural heritage passed on through generations This college became a constituent of the Jawaharlal Nehru Technological University w.e.f 02-10-1972 through an act of legislature along with other sister institutions under the control of the then Director of Technical Education, Government of Andhra Pradesh. Earlier, it was affiliated to Andhra University. In the year 2003 the college has become autonomous.

The main library is situated in a separate block housing more than 76,500 volumes and contributed 12 numbers of journals maintained by two qualified librarians and necessary supporting staff for 12 hrs a day for 6 days and 9 a.m to 1.00 pm on Sunday. It is undergoing changes for automation. In addition, a book-bank with more than 3500 volumes is at the disposal of students for borrowing by BC, SC and ST categories. These books are procured from the funds provided by the Social Welfare Department. Over and above, each of the Engineering Departments have Departmental Libraries to reduce the burden on the Central Library and for the convenience of staff.

### **LITERATURE REVIEW**

The literature gathered indicates that there are many studies which are concerned with users' usage and satisfaction level of library resources and services, and which determine how satisfied users are in academic, research and public libraries. These studies have identified the gap between users' usage and satisfaction of library resources and services.

Doraswamy & Madhavi (2022) conducted a study on Users' Expectations and Perceptions of Engineering Students on Infrastructural Facilities and Services. The primary focus is on examining and analyzing the user perceptions, satisfaction and expectations related to libraries, infrastructure, and services offered by NAAC-accredited engineering institutions in Guntur District of Andhra Pradesh, India. The researchers have focused on identifying the user satisfaction with library services as perceived by engineering students by examining patterns, commonalities as well as variations in their views, satisfaction levels and expectations. It also examined the perception and expectations that engineering students shared about the amenities and facilities provided by the library in general. On a comprehensive evaluation of the results, it is noted that none of the infrastructure facility statements have met user expectations with respondents showing a significant degree of dissatisfaction in this respect.

Madhavi & Doraswamy (2022) examine an analytical study on user expectation and perception of access to information in NAAC Accredited Engineering College Libraries in Guntur District of Andhra Pradesh. The researchers have sought to identify satisfaction levels among engineering students with information services by examining patterns, commonalities as well as variations in their views, satisfaction levels and expectations. It also examined the gap between the perceptions and expectations of engineering students about access to information services. On a comprehensive evaluation of the



results, it is noted that none of the statements on information services access have met user expectations with respondents showing a significant degree of dissatisfaction.

Kusumakumari & Doraswamy (2020) examine the level of satisfaction of various electronic resources and services available in NAAC Accredited Degree Colleges in Vijayawada city of Andhra Pradesh. A questionnaire was distributed of 1200 (635 PG students and 565 faculty members) users and 850 filled in questionnaires were returned, giving an overall response rate is 70.83%. The study revealed that the users are more satisfied with the Internet facility college website information, online journals and online books. Online databases, Online Public Access Catalogue (OPAC) and CD-ROM databases are the least ranked among electronic resources for lowest satisfaction level. There are no significant differences in the level of satisfaction with the available electronic resources and services between status (Postgraduate Students and Faculty Members) and disciplines (arts, sciences, and commerce and management).

Ravisanker Reddy & Doraswamy (2019) examine the level of satisfaction of various digital resources and services prevailed in engineering college libraries of Kadapa District of Andhra Pradesh. The survey design method with help of a well-structured questionnaire is used in the study. A total 819 users of engineering colleges were randomly selected as sample for this study. The study aimed at identifying the satisfaction of various digital resources such as e-books, e-journals, e-newsletters, e-theses/dissertations, e-indexing databases, e-abstracting databases, e-bibliographical databases, e-standards, institutional repositories, AICTE Consortium, DELNET resources and services, N-List resources NPTEL video lectures made by the users. The study revealed that the users are more satisfied with the CD/DVD databases, AICTE Consortium, NPTEL Video lectures, and DELNET resources and services compared to other digital resources. Institutional repositories and e-journals are the least ranked among digital resources for lowest satisfaction level.

Appalaswami Naidu & Doraswamy (2018) examine the identifies the information usage pattern of students and faculty members at Dr. V. S. Krishna Government Degree College, Visakhapatnam. It explores the purpose of students' information seeking, preferred sources of information, level of satisfaction with library resources, library staff, and the problems faced in searching information on the Internet. A questionnaire-based survey method was used. The questionnaire was distributed among 805 UG, PG students and Faculty members, out of this 682 are responded, the response rate was 84.72%. Most of the respondents were satisfied with the resources and services.

### **Objectives of the study**

The objectives of the present study are as follows:

- i. To know the users' satisfaction levels on the availability of library resources and services in Jawaharlal Nehru Technological University.
- ii. To examine the users' usage levels on the availability of library resources and services in Jawaharlal Nehru Technological University.
- iii. To determine the gap (Usage - satisfaction) on the availability of resources and services in JNTU Library, Kakinada.

### **Limitations**

1. The study covers only the postgraduate students (such as M.Tech., M.B.A. and M.C.A) of Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh.
2. It does not cover undergraduate students, faculty members, and supporting staff of JNTU, Kakinada.

## METHODOLOGY

The methodology of this research is based on the exploratory design.

1) Sources of the data

The required data for the study was collected from the primary and secondary sources. The primary data was collected from the questionnaires. The secondary data was collected from various sources like books, journals, websites etc.

2) Data collection instrument

The primary data was collected through questionnaire tool which was carefully designed and tested to analyse the usage and satisfaction levels of the availability of library print and digital resources and services in Jawaharlal Nehru Technological University, Kakinada.

3) Sampling instrument

The sampling technique used here is simple random sampling method.

4) Sample size

The sample size of this study comprises of 100 percent of the postgraduate students of Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh.

5) Sampling Population

This study is conducted among 600 postgraduate students of Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh. The response was received from 415 users which constitute 69.17% of response rate.

### 1. Data analysis

In order to know the overall satisfaction of various digital resources and services by the users of selected libraries, responses of highly, frequently, occasionally, and rarely used are assigned the weightages of 4, 3, 2, and 1 respectively. The total weightage and mean weightage is calculated for each information resource and service. Each information source and service has been ranked on the basis of its mean weightage.

#### 1) Ranked satisfaction verses usage pattern of resources and services

The rank obtained by the various resources and services for their satisfaction and usage levels is shown in Table 1.

**Table 1. Ranked Satisfaction verses usage level of resources and services**

S.No	Resources	Satisfaction Score	Rank Satisfaction	Usage Score	Rank Usage
1	Book lending service	3.32	1	3.58	1
2	Reference service	3.25	2	3.33	2
3	IT based services	2.96	3	3.19	3
4	Internet	2.91	4	3.16	4
5	Intranet	2.90	5	2.76	11
6	Old question papers	2.86	6	2.92	8
7	Newspapers	2.85	7	2.89	9
8	Reference books	2.84	8	2.93	7
9	Text books	2.80	9	2.94	6
10	College website	2.79	10	3.06	5

11	Dissertations/projects	2.76	11	2.80	10
12	Reprographic service	2.52	12	3.33	2
13	Periodicals/journals	2.50	13	2.67	12
14	Online lectures	2.40	14	2.51	13
15	OPAC	1.99	15	2.12	15
16	Online books	1.85	16	1.98	16
17	Online databases	1.79	17	1.75	17
18	CD-ROM databases	1.78	18	1.80	18
19	Online journals	1.73	19	2.20	14
20	Inter library loan	1.50	20	1.65	19
21	Current Awareness service	1.50	20	1.48	20
22	SDI service	1.45	21	1.45	21

It is evident from Table 1, with regard to the print resources that users are more satisfied with old question papers as compared to other print resources. With regard to the digital resources that users are more satisfied with the Internet facility as compared to other digital resources and services. With regard to the services, users are more satisfied with the book lending service as compared to other services.

With the overall satisfaction levels of users in each of the twenty two attributes ranked from 1 to 22 with their corresponding satisfaction ranking. The five most important areas satisfied by the postgraduate students were (1) book lending service (3.32 mean score), (2) Reference services (3.25 mean score), (3) IT based services (2.96 mean score), (4) Internet facility (2.91 mean score) and Intranet facility (2.90 mean score).

The five least satisfaction areas were (1) Selective dissemination of service (1.45 mean score), (2) Current awareness service (1.50 mean score), (3) Inter library loan (1.50 mean score), (4) online journals (1.73 mean score), and CD-ROM database (1.78 mean score).

## 2) Ranked usage pattern verses satisfaction of resources and services

The rank obtained by the various resources and services for their usage and satisfaction levels is shown in Table 2.

**Table 2. Ranked Usage pattern verses Satisfaction level of resources and services**

Resources	Usage Score	Rank Usage	Satisfaction Score	Rank Satisfaction
Book lending service	3.58	1	3.32	1
Reprographic service	3.33	2	2.52	12
Reference service	3.33	2	3.25	2
IT based services	3.19	3	2.96	3
Internet	3.16	4	2.91	4
College website	3.06	5	2.79	10
Text books	2.94	6	2.80	9
Reference books	2.93	7	2.84	8
Old question papers	2.92	8	2.86	6
Newspapers	2.89	9	2.85	7
Dissertations/projects	2.80	10	2.76	11
Intranet	2.76	11	2.90	5

Periodicals/journals	2.67	12	2.50	13
Online lectures	2.51	13	2.40	14
Online journals	2.20	14	1.73	19
OPAC	2.12	15	1.99	15
Online books	1.98	16	1.85	16
Online databases	1.75	17	1.79	17
CD-ROM databases	1.80	18	1.78	18
Inter library loan	1.65	19	1.50	20
Current Awareness service	1.48	20	1.50	20
SDI service	1.45	21	1.45	21

It is evident from Table 2, with regard to the print resources that the users preferred to use text books heavily as compared to other print resources. With regard to the digital resources that users prefer using the Internet heavily compared to other digital resources and services. With regard to the services that users preferred to use the book lending service heavily as compared to other services.

With the overall usage pattern levels of users in each of the twenty two attributes ranked from 1 to 22 with their corresponding usage ranking. The five most important areas heavily used by the postgraduate students were (1) book lending services (3.58 mean score), (2) reprographic and reference services (3.33 mean score each), (3) IT based services (3.19 mean score), (4) Intent facility (3.16 mean score) and (5) College website information (3.06 mean score).

### 3) Ranked gap analysis

The gap analysis identifies the performance of the libraries as perceived by postgraduate students. Gap analysis identifies the gaps between the usage levels of the resources and services and the satisfactory level of the resources and services. The mean values are derived by subtracting the 'mean score of satisfaction of resources and services' from the 'mean score of usage of resources and services'. This comparison reveals the gap analysis.

**Table 3. Ranked Gap Score (Usage - Satisfaction) of Library Resources and Services**

S.No	Resources and Services	Mean Satisfaction	Rank	Mean Usage	Rank	Mean Gap (U-S)	Rank
1	Reprographic service	2.52	12	3.33	2	0.81	1
2	Online journals	1.73	19	2.20	14	0.47	2
3	College website	2.79	10	3.06	5	0.27	3
4	Book lending service	3.32	1	3.58	1	0.26	4
5	Internet	2.91	4	3.16	4	0.25	5
6	IT based services	2.96	3	3.19	3	0.23	6
7	Periodicals/journals	2.50	13	2.67	12	0.17	7
8	Inter library loan	1.50	20	1.65	19	0.15	8
9	Text books	2.80	9	2.94	6	0.14	9
10	Online books	1.85	16	1.98	16	0.13	10
11	OPAC	1.99	15	2.12	15	0.13	10
12	Online lectures	2.40	14	2.51	13	0.11	11
13	Reference books	2.84	8	2.93	7	0.09	12

14	Reference service	3.25	2	3.33	2	0.08	13
15	Old question papers	2.86	6	2.92	8	0.06	14
16	Dissertations/projects	2.76	11	2.80	10	0.04	15
17	Newspapers	2.85	7	2.89	9	0.04	15
18	CD-ROM databases	1.78	18	1.80	18	0.02	16
19	Intranet	2.90	5	2.76	11	-0.14	17
20	Online databases	1.79	17	1.75	17	-0.04	18
21	Current Awareness service	1.50	20	1.48	20	-0.02	19
22	SDI service	1.45	21	1.45	21	0	20

Table 3 indicates the overall comparisons made at the outset, between the usage levels and satisfaction levels with regard to various library resources and services. It shows an absolute negative performance gap of all library resources and services except current awareness service, online databases and intranet facility. There is no gap between the usage and satisfaction level of SDI service.

The first five areas with the highest negative gap between the usage and satisfaction level of library resources and services such as (1) Reprographic service (0.81, with an satisfaction ranking 12/22), (2) Online journals (0.47, with an satisfaction rank 19/22), (3) College website information (0.27, with an satisfaction rank 10/22), (4) Book lending service (0.26, with an satisfaction rank 1/22) and (5) Internet facility (0.25, with an satisfaction rank 4/22).

## CONCLUSION

This study which measured both the user satisfaction and usage pattern gave a better picture of how well the library stands as a service organization. The most important areas are satisfied by the postgraduate students was book lending service followed by reference service, IT base services, Internet and Intranet facility. The highest usage items was book lending service, reprographic and reference service, internet facility and college website information. It shows an absolute negative performance gap of all library resources and services except current awareness service, online databases and intranet facility. There is no gap between the usage and satisfaction level of SDI service. The five areas with the highest gap between the usage and satisfaction level of library resources and services such as reprographic service, online journals, college website information, book lending service, and Internet facility.

“It is clear from the study that the library/information resources and services available in Jawaharlal Nehru Technological University Library, Kakinada, Andhra Pradesh are not adequate. The resources are either not available or inadequate or they are not trained to make use of them, which is the reason for such negative gaps in performance growth.”

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# Presidential Candidates' Facebook Posts During the 2022 Philippine National Election: A Content Analysis Study

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## ABSTRACT

The 2022 Philippine National Election witnessed a significant shift in political communications and campaigning strategies due to the utilization of Facebook. This study examines the impact of Facebook on the political communications of Bongbong Marcos and Leni Robredo during the election period. Through content analysis of posts from their official Facebook pages, this research explores the candidates' use of the platform, including the types of media employed, the prevalent themes, and the level of engagement through comments, shares, and reactions. The preliminary findings highlight that both candidates employed a combination of text and multimedia content to disseminate information, particularly during the peri-election period. Building upon these results, our future study aims to delve deeper into a larger sample of Facebook posts to identify key themes in digital content and develop guidelines for enhancing new voters' digital literacy, specifically in creating and communicating political content.

**Keywords:** 2022 Philippines National Election, Information dissemination, Facebook, Social media

## INTRODUCTION

The continuous progress of information and communications technology, especially the internet, has brought about a paradigm shift in the dissemination of information, primarily through social media platforms such as Facebook (Aharony, 2013; Vu, 2011). Consequently, the significance of digital literacy has escalated, necessitating individuals to acquire the competence to access, organize, analyze, and integrate digital information (Casañ-Pitarch & Candle-Mora, 2021; Lukitarasi et al., 2022).

In today's digital landscape, digital literacy encompasses not only the consumption of digital content but also the creation and effective communication of such content, where social media platforms like Facebook play a pivotal role (Spires & Bartlett, 2012). Within the realm of digital literacy, photo-visual literacy has emerged as a vital component, enabling individuals to effectively convey information through visual media (Eshet-Alkalai & Amichai-Hamburger, 2004). Furthermore, synchronic learning has been conceptualized as a form of photo-visual literacy, leveraging multimedia environments to stimulate learners through synchronized text, sound, and motion (Eshet-Alkalai, 2002). The accessibility and convenience provided by digital media have democratized the creation of digital content, making it more accessible to the general public (Moon & Bai, 2020).

Facebook has emerged as a powerful platform for the widespread sharing and dissemination of information, revolutionizing the landscape of political campaigns and communication (Gërguri, 2019; Babac & Podonik, 2018). It offers politicians a cost-effective and ubiquitous tool to establish direct connections with the public, circumventing the traditional media scrutiny prevalent in many democratic countries today (Alperin et al., 2018; Auter & Fine, 2018; Babac & Podonik, 2018). In the context of the Philippines, the 2016 National Election witnessed the significant utilization of Facebook, playing a crucial role in President Rodrigo R. Duterte's successful campaign (Arugay & Baquisal, 2022). Numerous studies have emphasized the significance of Facebook in political campaigns during the 2016 elections, despite Duterte's limited resources and social media posts (Bajar, 2017; Sinpeng et al., 2020; Ellmers, 2018).

In light of the growing influence of social media in Philippine elections and the increasing number of social media users, this research aims to investigate the strategic utilization of official Facebook pages by the two prominent Presidential Candidates, Bongbong Marcos and Leni Robredo, during the 2022 Philippine National Election. The study examines various aspects of the candidates' public posts, including the themes covered, the types of media employed, the frequency of posting, and the level of user engagement, all of which align with the essential components of digital literacy (Baptista & Gradim, 2020; Tandoc, 2019). By comprehending these characteristics, individuals can effectively navigate, consume, create, and communicate digital content, while also addressing the issue of misinformation, as the presentation and formatting of information play a significant role (Meta, n.d.).

### **The 2022 Philippine National Election**

On May 9, 2022, the Philippines witnessed the election of its 17th President, who would succeed Former President Duterte. During this election, 10 aspirants vied for the presidential seat (De Leon, 2022). This study primarily focuses on two prominent candidates, Ferdinand "Bongbong" Marcos Jr., who eventually emerged as the victor, and Maria Leonora "Leni" Robredo, the incumbent Vice President during the election but unsuccessful in her bid. The total number of registered Filipino voters eligible to cast their votes in this election amounted to 65,745,512 million individuals (Vote Pilipinas, 2020c; GMA News Online, 2022). According to the Philippine Commission on Elections (COMELEC), a significant portion of the electorate consisted of the youth or "prime movers," specifically individuals aged 18-41 (Lopez, 2022).

Since the previous election in 2016, social media platforms, particularly Facebook, have played a pivotal role in the electoral campaigns of all candidates (Sinpeng et al., 2020; Ressa, 2016; Quitzon, 2021). This year, all candidates utilized social media, particularly Facebook, as an essential tool, which was further amplified by the necessity arising from the election taking place amidst the ongoing pandemic (The Manila Time, 2022). Moreover, Filipino users have increasingly connected to the internet and dedicated more time to gathering political information (Arugay & Baquisal, 2022; Kemp, 2022). Recent reports from NapoleonCat (2022) indicate a significant surge in the number of Facebook users in the Philippines as of February 2022, with the majority falling within the age range of 18-24 (30.8%), followed by the age groups of 25-34 (28.2%) and 35-44 (15.1%). This increase in Facebook users aligns with Pulse Asia's survey on Filipino internet usage during the 2022 election campaign, which revealed a substantial rise in the utilization of the internet to access election-related information, particularly in March 2022 (Arugay & Baquisal, 2022). Notably, the age group comprising the "prime mover" voters coincides with the age group exhibiting the highest Facebook usage.



## **The Candidates**

### **Ferdinand “Bongbong” Marcos Jr.**

Ferdinand "Bongbong" Marcos Jr.'s presidential campaign centered around the theme of unity and focused on various issues, including pandemic response, anti-insurgency efforts, the war on drugs with an emphasis on prevention and rehabilitation, education, job opportunities, public services, and social safety nets (Aljazeera, 2022; Patag, 2022; Vote Pilipinas, 2020a). However, his campaign faced challenges due to the reputation of his family and personal controversies. Critics speculated that he benefited from the spread of disinformation and exaggerated narratives about his family's wealth and educational records (De Guzman, 2022; van Wagtenonk, 2022). Marcos Jr. faced scrutiny over inconsistencies with his degrees and a conviction for tax evasion (Johnson & Simonette, 2022; Morales, 2022; Rappler, 2021; Ratcliffe, 2022). Despite these controversies, his supporters, particularly among the younger generation, rallied behind him, emphasizing his potential to continue his father's "legacy" and bring progress to the country (Aljazeera, 2022; Novio, 2022). His campaign message of unity resonated with his followers in traditional campaigns (De Guzman, 2022), and social media, especially Facebook, played a significant role in amplifying his campaign's message (Buddhavarapu, 2022; Philippine Embassy-Tokyo, Japan, n.d.; Ratcliffe, 2022).

Marcos Jr. has been involved in politics since his early years, benefiting from his father's dictatorship (Rappler, 2021). He held various political positions, including vice governor, governor of Ilocos Norte province, senator, and a previous run for vice president in 2016. (Buddhavarapu, 2022; Caballero-Anthony, 2022; McCarthy, 2022; Morales, 2022; Ratcliffe, 2022; Regan, 2022). Despite his defeat in the vice presidential race and subsequent electoral protests (Morales, 2022), Marcos Jr. persisted and ultimately won the 2022 presidential election, capitalizing on his well-coordinated social media presence and the unwavering support of online influencers and millions of social media accounts (Macaraeg, 2022).

### **Maria Leonora “Leni” Robredo**

As the only female candidate among the presidential contenders, Maria Leonora “Leni” Robredo announced her candidacy for the 2022 Philippine National Election with a platform focused on addressing the challenges of the pandemic, promoting human rights, and ending the "culture of violence" in the country (Friedrich Naumann Foundation for Freedom, 2020). Despite facing waves of disinformation and gender-based criticisms (BBC News, 2022; Ferreol, 2022; Sui-Lee, 2022; Wong, 2022), Robredo received support from diverse sectors, particularly the younger generations (Cabato, 2022; Ferreol, 2022; Lopez & Calonzo, 2022; Novio, 2022; Sui-Lee, 2022; Tatler, 2022). Grassroots campaigning and social media, particularly Facebook, played significant roles in mobilizing support for her campaign (Macaraeg, 2022; Salazar, 2022).

Prior to entering politics, Robredo had a track record of public service as a researcher, professor, human rights lawyer, and social activist. She advocated for the rights of marginalized communities and founded organizations to empower women (Cabato, 2022; Esguerra, 2022; Rappler, 2021; Ratcliffe, 2022; Vote Pilipinas, 2020b; Yeo, 2016). Robredo entered politics after the death of her husband and won a congressional seat, becoming the principal author of several bills (Esguerra, 2022; Friedrich Naumann Foundation for Freedom, 2020; Sui-Lee, 2022; Vote Pilipinas, 2020b; Yarlagadda, 2023). Later, she was elected as Vice President, where she championed causes such as poverty alleviation and human rights through her flagship program, “Angat Buhay” (Cabato, 2022; Ferreol, 2022; Sui-Lee, 2022; Vote Pilipinas, 2020b). Her office received accolades for its financial management and efficient delivery of programs from the Commission on Audit from 2018 to 2022 (CNN, 2022; Ferreol, 2022; Vote Pilipinas, 2020b).

Although Robredo finished as the runner-up in the presidential race, she continues to serve as a private individual through her non-government organization, Angat Pinas, Inc. (Cepeda, 2022; Yarlagadda, 2023), and was invited to participate in a leadership program at Harvard University (Mateo, 2022). Her commitment to public service remains strong despite not holding an official government position.

## **METHODOLOGY**

### **Data Collection**

For the pilot study, the dataset comprises the ten most recent posts from each of the presidential candidates Ferdinand Marcos Jr. and Leni Robredo, spanning three distinct election periods: pre-election (October 1, 2021 - January 8, 2022), peri-election (January 9, 2022 - May 9, 2022), and post-election (May 10, 2022 - June 8, 2022). This selection results in a total of 30 posts per candidate, amounting to 60 posts in total.

To gather the posts, a manual approach was adopted, involving scrolling through the official Facebook pages of Marcos Jr. and Robredo. Relevant information such as the number of comments, shares, reactions, and the post's caption was meticulously recorded. Google Spreadsheet was utilized to record numerical features, while Google Docs facilitated the documentation of captions. Each post was assigned a specific file naming convention to serve as a unique identifier during the subsequent coding phase.

In line with ethical research practices, utmost consideration was given to ethical obligations when conducting research on Facebook. Only publicly accessible posts during the election period, specifically those set to the "Public" privacy setting, were collected. Personal information of individuals reacting, commenting, and sharing the posts will not be included or disclosed.

### **Codebook Development**

In the coding of the Facebook posts, the study adopts the thematic framework presented in Bajar's (2017) work, encompassing nine distinct themes: Personal Life; Election Campaigns and Political Advertisements; Self-Descriptions; Experience in Government Service; Advocacies and Electoral Platforms; Quasi-Official Functions; Public Announcements; Political Positions; and Entertainment. Each theme is assigned a unique single-digit numeric code, following the same order of themes as outlined by Bajar (2017). A codebook is developed based on these themes and applied to the analysis of Facebook posts.

Throughout the coding process, extensive discussions were conducted to ensure consensus among the coders, and additional definitions were incorporated to align with the specific context of this study. These discussions and refinements served to enhance the accuracy and relevance of the coding process.

### **Coder Training**

For this study, the coders were carefully chosen based on their familiarity with the electoral landscape in the Philippines and their professional alignment with library and information studies. Both coders selected were professional librarians practicing in the Philippines, registered as voters who actively participated in the 2022 Philippine National Elections, and have been the regular users of Facebook.

Prior to coding the posts, both coders underwent a thorough familiarization process with the coding procedure and the theoretical foundation of the codebook. They were provided with the same set of Facebook posts to identify areas where the codebook could be developed. Any coding challenges,

discrepancies, or disagreements that arose were discussed extensively to achieve a consensus among the coders. As a result of these discussions, the codebook was refined, revised, and supplemented with additional clarifications to enhance its effectiveness and accuracy.

### **Data Management and Coding Analysis**

The captions of the posts were collected manually and recorded in a Google Document file. To facilitate the coding process, a coding sheet was created using Google Spreadsheets, containing the necessary information such as the post identification, date, and link. Human coders utilized this coding sheet by entering the appropriate codes in the designated column within the Google Spreadsheet. Following the completion of the coding, a thorough check was conducted to ensure that all posts were successfully coded and that no posts were inadvertently left uncoded.

## **FINDINGS**

### **Codebook Development**

The themes adapted from Bajar (2017) were successfully utilized in this study during the codebook development process. The posts that were coded were then analyzed to calculate Krippendorff's alpha, which was used to assess the level of agreement. The intercoder reliability was found to be high, with a Krippendorff  $\alpha$  value of 0.945. The unit of analysis was further examined by two coders, and the intercoder reliability was assessed to range from Krippendorff  $\alpha=0.96$  to 1.00. To measure the intercoder reliability between the two coders, ReCal2, an online utility developed by Dr. Deen Freelon (2010), was used. ReCal2 is designed to compute intercoder/interrater reliability coefficients for nominal data coded by two coders.

During the pilot study's coding process, six out of the nine themes mentioned in Bajar's (2017) work (Table 1) were used by the coders. The remaining three themes, namely Personal Life, Quasi-Official Functions, and Political Positions, were labeled as "undefined" during the interrater reliability assessment. These themes were not utilized because the coders determined that none of the posts in the collected pilot study data corresponded to the descriptions provided. The theme of Personal Life typically encompasses the hobbies, interests, personal information, and experiences of politicians, which are usually considered private matters. Additionally, "Quasi-Official Functions" refers to activities undertaken by candidates holding incumbent positions during the election period that are unrelated to their primary mandate. Lastly, the theme of Political Positions pertains to posts containing the candidates' stances or opinions on local, national, or international issues concerning specific groups, individuals, events, trending topics, or objects. However, it is important to note that all codes will be used for the final data coding, despite the exclusion of these themes during the preliminary study. This decision is based on the fact that this study only utilized a limited number of posts, specifically the latest ten codes per election period per candidate. This approach deviates from the potential inclusion of all publicly published posts in the actual data analysis.

**Table 1. Summary of themes after the coding process for the pilot study  
(Adopted from Bajar, 2017)**

No.	Theme	Criteria	Intercoder Reliability
1	Election Campaigns and Political Advertisements	It includes posts related to their campaign escapades. It also covers political strategies that include statements of rhetorical value which may encourage voters to vote for him or her, and the repetition of slogans in their posts.	$\alpha = 0.964$
2	Self-Descriptions	These include descriptions that may uplift the image and/or character of oneself. The posts include acts that improve their image build-up. Examples are posts describing their own self or a recorded quote of video speaking about him or her.	$\alpha = 1$
3	Experience in Government Service	It includes their past and present activities as an employee in the legislative, executive, and judicial branches of the government. It also includes posts that attach the previous or current government title of a politician, such as Mayor, Senator, or Secretary preceding their names.	$\alpha = 1$
4	Advocacies and Electoral Platforms	This includes posts which tackles an advocacy or platform which indicate their implementation in due time after they are elected into office. It also includes the depiction of personal advocacy and commitments that are underway and there is a hint of continuation for future purposes. It covers all election period, and posts published by both the winner and the losing candidate.	$\alpha = 1$
5	Public Announcements	It includes posts about news updates, a notice for an upcoming calamity or disaster, and posts which acknowledge representatives of the country to international competitions. It includes posts that incorporate links from news and media agencies. In the context of this study, this will also include posts intended to address the public, like announcements for the public, updates, public information, warnings, acknowledgment of representatives of the country or guests, and greetings for holidays or special occasions.	$\alpha = 0.96$
6	Entertainment	The purpose of these posts are to enjoy, amuse and/or entertain the viewers. They include posts depicting videos and pictures with amusing tone whether the subject is in relation to politics or not.	$\alpha = 1$

## Content Analysis

In the pilot study, a total of 60 posts were analyzed. Marcos emerged as the leader in terms of the number of comments (94.79%) , shares (72.78%) , reactions (74.33%) , and overall interaction (76.19%). This dominance was particularly evident during the Peri-election period. On the other hand, Robredo significantly lags behind Marcos. Robredo only accounted for 23.81% of the overall interaction, with 5.21% of all comments, 27.22% of total shares, and 25.67% of all reactions. It is worth noting that these figures can be influenced by the number of followers on each candidate's Facebook page. A larger digital followership tends to generate greater support and engagement with the candidates' posts (Keller & Kleinen-von Königslöw, 2018). According to data collected in 2021 before the elections, gathered by ABS-CBN through CrowdTangle by Facebook (Tinampay, 2022), Marcos had reached 4.36 million followers, whereas Robredo lagged behind with only 1.79 million followers.

Regarding the number of media used, both candidates employed various combinations to disseminate information, resulting in a total of seven combinations of media utilized (Table 2). Notably, both candidates predominantly used a combination of Text and Photo in their posts, with Marcos having 18 instances and Robredo having 17 instances. This trend was particularly prominent during the Post-Election period. What makes these findings interesting is that each candidate utilized certain media combinations that the other candidate did not. Marcos employed combinations such as Text with Live Video (f=4) and Text with Vlog (f=3). On the other hand, Robredo utilized the combination of Text, Photo, and Video (f=1).

**Table 2. Media used by Marcos and Robredo**

No.	Media	Pre-election		Peri-election		Post-election		TOTAL	
		Marcos	Robredo	Marcos	Robredo	Marcos	Robredo	Marcos	Robredo
1	Text, Live Video	0	0	4	0	0	0	4	0
2	Text, Photo	6	5	3	5	9	7	18	17
3	Text, Photo, Link	1	3	2	0	0	0	3	3
4	Text, Photo, Video	0	0	0	1	0	0	0	1
5	Text, Video	0	1	1	4	0	2	1	7
6	Text, Video, Link	1	1	0	0	0	1	1	2
7	Text, Vlog	2	0	0	0	1	0	3	0
	TOTAL	10	10	10	10	10	10	30	30

**Table 3. Themes used by Marcos and Robredo**

NO.	Themes	Pre-election		Peri-election		Post-election		TOTAL	
		Marcos	Robredo	Marcos	Robredo	Marcos	Robredo	Marcos	Robredo
1	(1) Personal Life	-	-	-	-	-	-	0	0
2	(2) Election Campaigns and Political Advertisements	2	1	9	9	-	-	11	10
3	(3) Self-Descriptions	-	-	-	-	1	-	1	0

4	(4) Experience in Government Service	-	4	-	-	-	2	0	6
5	(5) Advocacies and Electoral Platforms	1	-	-	1	7	4	8	5
6	(6) Quasi-Official Functions	-	-	-	-	-	-	0	0
7	(7) Public Announcements	6	5	1	-	2	4	9	9
8	(8) Political Positions	-	-	-	-	-	-	0	0
9	(9) Entertainment	1	-	-	-	-	-	1	0
	TOTAL	10	10	10	10	10	10	30	30

In terms of the type of information they disseminate, the posts were coded using various themes. Table 3 illustrates that both candidates published posts discussing their Election Campaigns and Political Advertisements, particularly during the Peri-election period. Over the course of the election period, Marcos utilized five different themes in his posts: Election Campaigns and Political Advertisements (f=11), Self-Descriptions (f=1), Advocacies and Electoral Platforms (f=8), Public Announcements (f=9), and Entertainment (f=1). On the other hand, Robredo's posts encompassed themes such as Election Campaigns and Political Advertisements (f=10), Experience in Government Services (f=6), Advocacies and Electoral Platforms (f=5), and Public Announcements (f=9). Interestingly, it is evident that certain themes were exclusively used by each candidate. Marcos shared information about Self-description prior to the election and Entertainment after the election. Conversely, Robredo focused on sharing information and content related to her Experience in Government Services both before and after the election.

To analyze the relationship between media usage and post themes, the posts were ranked according to the number of comments, shares, reactions, and overall interactions they received. This ranking aimed to identify the media utilized and the themes proliferated in the highly engaging posts of Marcos and Robredo. Notably, both candidates' posts that garnered the highest number of comments, shares, and reactions were predominantly published during the Peri-election period, as shown in Table 4 and Table 6.

**Table 4. Marcos' post that received the most number of comments, shares, reactions, and interactions**

Engagement	f	Media	Theme	Date	Post Identifier
Comments	411,000	Text, Live Video	2	May 7, 2022	M0037.20220507
Shares	270,000	Text, Video	2	May 3, 2022	M0044.20220503
Reactions	1,544,517	Text, Live Video	7	May 9, 2022	M0036.20220509
Interactions	1,990,517	Text, Live Video	7	May 9, 2022	M0036.20220509

**Table 5. Marcos' post that received the least number of comments, shares, reactions, and interactions**

Engagement	f	Media	Theme	Date	Post Identifier
Comments	326	Text, Video, Link	2	January 5, 2022	M0316.20220105
Shares	424	Text, Video, Link	2	January 5, 2022	M0316.20220105
Reactions	18,336	Text, Video, Link	2	January 5, 2022	M0316.20220105
Interactions	19,086	Text, Video, Link	2	January 5, 2022	M0316.20220105

In Table 4, it is evident that Marcos' posts that received the highest number of Comments, Reactions, and overall Interaction utilized a combination of Text and Live Video. These posts, published on May 7 and 9, 2023, aimed to disseminate information about Election Campaigns, Political Advertisements, and Public Announcements. Additionally, the most Shared post by Marcos utilized a combination of Text and Video, serving the purpose of Election Campaigns and Political Advertisements. Turning to Robredo's posts in Table 6, the post that received the most Comments (8,100), Shares (74,000), Reactions (752,747), and ultimately became the post with the highest Interaction (1,033,247) employed the Text and Video format. It was also focused on disseminating information related to Election Campaigns and Political Advertisements. Notably, both candidates' posts that generated the highest engagement were published on May 7, just before the campaign period ended. This heightened activity can be attributed to the fervor of online support, as supporters aimed to show their last-minute backing for the candidates.

**Table 6. Robredo's posts that received the most number of comments, shares, reactions, and interactions**

Engagement	f	Media	Theme	Date	Post Identifier
Comments	8,100	Text, Video	2	May 7, 2022	R0024.20220507
Shares	74,000	Text, Video	2	May 7, 2022	R0024.20220507
Reactions	752,747	Text, Video	2	May 7, 2022	R0024.20220507
Interactions	1,033,247	Text, Video	2	May 7, 2022	R0024.20220507

**Table 7. Robredo's posts that received the most number of comments, shares, reactions, and interactions**

Engagement	f	Media	Theme	Date	Post Identifier
Comments	116	Text, Photo, Link	7	January 7, 2022	R1070.20220107
Shares	150	Text, Photo, Link	7	January 5, 2022	R1076.20220105
Reactions	4,000	Text, Photo	7	January 8, 2022	R1068.20220108
Interactions	4,601	Text, Photo	7	January 8, 2022	R1068.20220108

During the Pre-election period, both candidates' posts received the lowest number of Comments, Shares, Reactions, and Interactions. In the case of Marcos (Table 5), this was attributed to a single post published on January 5, 2022, which aimed to disseminate information about Election Campaigns and Political Advertisements. The media used for this post was Text, Video, and Link. On the other hand, Robredo's posts that received the lowest number of Comments and Shares (Table 7) utilized the media combination of Text, Photo, and Link, primarily intended for Public Announcements. The post that garnered the least number of Reactions and Interactions also served the purpose of Public Announcements, employing the media formats of Text and Photo.

## **DISCUSSION**

In the context of election campaigns, information dissemination plays a crucial role in reaching the public (Babac & Podonik, 2018; Gërguri, 2019). The impact of technological advancements, particularly social media platforms like Facebook, became evident in the previous Philippine election in 2016 (Ressa, 2016; Sinpeng et al., 2020). In the 2022 Philippine National Election, Marcos and Robredo emerged as prominent contenders for the Presidential seat, both utilizing Facebook as a key tool in their campaigns. The majority of posts from both candidates were dedicated to the dissemination of information regarding Election Campaigns and Political Advertisements. Notably, both candidates employed a combination of media types in their posts and rarely relied solely on text. The prevalent use of Text and Photo aligns with discussions on digital literacy skills, particularly photo-visual literacy (Eshet-Alkalai & Amichai-Hamburger, 2004), as well as multimedia learning (Mayer, 2009). These literacies suggest that individuals can better understand and absorb information when it is presented using a combination of words and visuals.

For our future study, we plan to conduct a comprehensive analysis of the remaining posts from both presidential candidates throughout the entire election period. This will allow for a deeper exploration of the candidates' use of different media types and themes. Moreover, we will discuss the findings in more detail, focusing on each election period separately to uncover how the candidates adjusted their posting strategies during specific timeframes. Additionally, we will provide a more thorough examination of the frequency of postings, as the data for the entire election period covers a span of 251 days or 37 weeks, taking into account the vote counting weeks (Briney, 2018).

Based on the findings of the initial investigation, the forthcoming research endeavors to enhance the digital literacy of social media users, specifically in the realm of creating and communicating digital content, particularly in relation to political information. The objective is to equip users with the knowledge and skills required to determine the appropriate media formats and combinations for effectively presenting their content.

Additionally, the study aims to foster awareness among social media users regarding the impact of their engagement on the virality of posts. Consequently, users will recognize their significant role as agents of virality, wherein their actions of engaging, such as reacting, commenting, and sharing posts, contribute to the dissemination of information.

Lastly, the research will provide a methodological framework for future scholars interested in conducting studies involving social media, with a specific focus on analyzing Facebook posts. This framework will serve as a guide for researchers wishing to further investigate various aspects of social media and its implications.



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# The Evolution of Banking and Financial Technology: A Bibliometric Study of Global Research

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## ABSTRACT

This bibliometric study analyzed the evolution of banking and financial technology research on a global scale, utilizing a comprehensive dataset of academic articles from Scopus databases. The objective of the study was to identify significant research themes and track their development over time, using descriptive statistics and network analysis techniques to evaluate the impact of research factors. The results of the study indicate that FinTech research has grown rapidly over the past decade, with a substantial increase in publications on topics such as blockchain, mobile banking, and financial inclusion. The statistical data shows a significant increase in research output from the banking industry, with 5,405 documents examined from 2,470 sources, having an average yearly growth rate of 6.67%. Collaboration among researchers was prevalent, with an average of 2.84 co-authors per document, and international co-authorship accounted for 19.74% of the documents. The study identified the top 10 relevant sources in the field, with Lecture Notes in Networks and Systems being the most commonly used source, and IEEE Access being the most widely cited source with the highest H-index. The research indicates the high recognition and impact within the academic community, with documents having an average citation of 12.8. In summary, the study provides valuable insights into the development of FinTech research and its impact on the academic community.

**Keywords:** Financial Technology, Banking Technology, Blockchain, Bibliometric

## INTRODUCTION

FinTech, a term commonly used to refer to financial technology, encompasses various technologies that digitize and optimize traditional financial services, such as banking and payment methods. FinTech includes financial applications, software, programs, and algorithms used on desktop computers or mobile devices. Even specific hardware, like internet-enabled piggy banks and ATMs, are considered part of FinTech. When individuals use an app on their smartphone to check their bank account balances

or make online purchases, they are utilizing FinTech. Although the term "FinTech" may sound like a new development, its concept is not necessarily new. According to the Merriam-Webster Dictionary, the first known use of the term was in 1971, which was two years after the first ATM was opened in Rockville Center, New York. At that time, ATM was considered a cutting-edge FinTech platform, although the term "FinTech" had not yet been coined. Another early example of FinTech was the development of a centralized signature verification system for checks in the early 1990s.

Over the decades, FinTech has continued to evolve. The introduction of NASDAQ in 1971 and the advent of full-scale online banking in the early 1980s were prominent manifestations of FinTech. By the turn of the millennium, eight banks in the United States had more than a million online customers combined, which was a considerable adoption of FinTech in 2001, although it may seem like a small number now. In 2014, JP Morgan's CEO, Jamie Dimon, noted in an annual letter to shareholders that hundreds of startups were reducing lending "pain points" by underwriting loans in minutes instead of weeks, and that these startups were becoming competitors to the company's services. However, it took JP Morgan five more years to make a notable \$25 million investment in FinTech startups. In contrast, Goldman Sachs launched an online bank called Marcus three years earlier, demonstrating how disruptive FinTech is to conventional banking services. Existing financial firms are either providing millions in venture funding for startups or creating their FinTech ventures to stay competitive. Online banking, which is a combination of traditional and technology-enabled financial services, has become a common phenomenon seen not only in developed nations but also worldwide.

The financial industry has experienced significant technological changes in recent years, with the advent of digital technologies, mobile banking, and cryptocurrency. As a result, there has been a surge in research on banking and financial technology, exploring the impact of new technologies on the industry, and identifying opportunities for innovation. Bibliometric analysis is a powerful tool for understanding the evolution of research in a particular field. In this study, we aim to conduct a bibliometric analysis of published research on banking and financial technology, to map its evolution and identify key trends in research output. The study will explore the research themes, publication trends, collaboration networks, and citation patterns of published research in banking and financial technology, using bibliometric techniques. By analyzing published research, we can identify the most influential researchers, institutions, and countries in the field. Additionally, we can identify the most productive research areas, the most influential journals, and the most significant research gaps.

The study is significant because it will provide a comprehensive overview of the research on banking and financial technology, identifying the key areas of research, and the most influential researchers in the field. This study will be useful for researchers, policymakers, and practitioners, who can use the insights gained from the bibliometric analysis to inform their research agenda and identify opportunities for collaboration. The paper is organized as follows: First, we provide a review of the literature on bibliometric analysis and its application to banking and financial technology research. Second, we describe the methodology used in this study, including the data sources, search terms, and bibliometric indicators. Third, we present the results of the bibliometric analysis, including the research themes, publication trends, collaboration networks, and citation patterns. Finally, we discuss the implications of the findings for future research and conclude the paper.

## **LITERATURE REVIEW**

Digital finance is posing a challenge to traditional financial service providers like banks and insurance companies due to the increasing competition from FinTech companies. This competition is providing a unique opportunity for these providers to reach out to their younger and more innovative technological clients (Arner et al., 2015; Joshi, 2020; Wang et al., 2021). Given this scenario, there is an ongoing conversation among conventional financial intermediaries about how to manage FinTech companies.

There is a debate on whether to pursue competitive approaches like acquisitions or explore alternative options such as engaging these firms as service providers who align with their business models for e.g., Lai (2020); Suprun et al. (2020); Vučinić, 2020. Technology has opened up new possibilities for financial service providers to stay competitive and offer fresh and appealing services to their customers.

The study of Krika (2022) discusses the growing interest in digital finance, particularly in the area of financial technology (Fintech), and the implications of technological advancements on the financial industry. The study conducted a bibliometric analysis of 343 articles on the connections between financial technology developments and digital finance, identifying research gaps and suggesting areas for further study. The results provide a solid path for future research in this area, including analyzing citation linkages between important articles and identifying potential routes for researchers to expand on current knowledge and seek new possibilities for research. The study by Abbas et al. (2019d) found that highly innovative firms tend to build business networks to achieve sustainable performance. These firms achieve sustained performance by employing effective business networks and flexible capacities. The study offers a systematic and holistic approach to achieving sustainable performance through the dynamic capacities of businesses. This study contributes to the literature on the link between digital finance and FinTech through a bibliometric analysis of research data from 2006 to 2020, with a focus on recent studies from 2018 to 2020. The article is structured into sections discussing the research method and questions, methods and materials, results and discussion, and conclusion and limitation.

The research of Bajwa et al. (2022) has conducted a meta-literature review that examines past, present, and future trends in Fintech research, analyzing 360 selected articles published between 2006 and June 2020 using both quantitative and qualitative techniques. The quantitative analysis used HistCite and VOSviewer software for bibliometric citation analysis, while the qualitative analysis identified four main research streams related to Bitcoin and digital currency, crowdfunding, mobile payment, and blockchain. Results highlight influential aspects of the Fintech literature, including leading countries, institutions, journals, authors, and articles. Suggestions for future directions in Fintech research are also provided. Moreover, the study of Qi et al. (2022) uses bibliometric analysis to map the conceptual structure of bank risk research, analyzing 671 publications from January 1978 to October 2022. The analysis identifies the main traits of scholars debating bank risk, including annual production of publications, most productive authors, countries, affiliations, and journals, and most cited articles in the dataset. The study also performs a co-word analysis using social network analysis tools to analyze the conceptual structure of the dataset. Results show growing academic interest in bank risk research topics, especially following the global financial crisis. Three main topics emerge from the bibliometric analysis, including the adoption of risk management and bank risk, the use of bank risk during the financial crisis, and the interrelations between corporate governance and bank risk.

Overall, these studies demonstrate the importance of bibliometric analysis in gaining insights into complex and rapidly evolving fields such as finance and Fintech. By analyzing patterns of citation and co-citation, researchers can identify key topics, leading scholars, and emerging trends, providing valuable guidance for future research. These studies also highlight the interdisciplinary nature of research in finance and Fintech, drawing on concepts from economics, technology, and business management.

## **METHODOLOGY**

To find relevant publications, we utilized the SCOPUS database with a publication period from January 2009 to March 2023 and searched for "Banking technology" and "Financial technology," along with related keywords such as "Blockchain" and "Cryptocurrency" in the article title, abstract, and keyword field. We have chosen the SCOPUS database because it is a well-known resource for multidisciplinary



research articles and citations. SCOPUS, part of Elsevier's analytics and big data company, provides an online resource for access to peer-reviewed, globally popular academic publications. SCOPUS provides 1.8 billion cited references dating back to 1970, 84 million database records, 17.6 million author profiles, and 94.8 thousand affiliation profiles from 7+ thousand publishers worldwide (<https://www.elsevier.com/solutions/scopus>). We ensure that the Scopus database provides a high-quality and reliable basis for bibliometric analysis.

In selecting our search criteria, we looked at keywords that cover various aspects of the intersection between financial services and technology. These terms appear in scholarly articles, research papers, and financial and banking technology industry reports. The result was ten keywords: FinTech, Banking technology, Digital banking, Mobile banking, Online banking, Payments, Blockchain, Cryptocurrency, Peer-to-peer lending, and Crowdfunding.

We looked at these ten terms against the search classifications grouped in the SCOPUS database. We found that SCOPUS has systematically grouped the terms into Banking Technology and Financial technology. The SCOPUS keyword search facet also indicates that there are academic articles related to Banking Technology and Financial technology associated with Blockchain, so we have decided to use those three terms as the primary keywords for this search.

The search strategy and terms for the Banking and Financial technology research are presented in Figure 1. We carefully selected the search terms to ensure that the retrieved publications are both comprehensive and accurate in answering our research question. We then applied specific criteria, such as publication year and journal scope, to filter the results and obtain relevant publications.

On 4 April 2023, we retrieved research data related to "The Evolution of Banking and Financial Technology" by searching for applicable articles in the Scopus database. The search was conducted on published articles' titles, abstracts, and keywords using the keywords "Financial Technology" OR "FinTech" AND "Banking Technology" OR "Bank Tech" AND "Blockchain\*" OR "Cryptocurrency\*". An asterisk (\*) was added after the words "Blockchain" and "Cryptocurrency" to broaden the search results. The dataset obtained from this search included 5,405 documents of various types, including articles, book chapters, conference papers, books, and reviews. The dataset was extracted in both RIS (.ris) and BIBTEX (\*.bib) formats for analysis in VOSviewer and Biblioshiny, respectively.

The RIS and BIBTEX formats are two popular file formats used for managing bibliographic references. While they both have comparable functions, the two forms have several significant distinctions. The RIS and BIBTEX formats are two popular file formats used for managing bibliographic references. While they both have comparable functions, the two forms have several significant distinctions. LaTeX, a typesetting program, is frequently used along with BibTeX to create academic and scientific publications. Academics and researchers frequently use it to arrange references in LaTeX texts. On the other hand, RIS is a standard format for exporting and importing bibliographical references used by many databases and reference management programs.

We use two tools for bibliographic analysis and visualization tools: (1) VOSviewer is a widely used software tool for visualizing and analyzing bibliographic and scientific data. VOSviewer offers a variety of visualizations and analytical methods to assist researchers in concluding massive datasets, particularly scholarly literature. (2) Biblioshiny, an application providing a web server for bibliometrics. It allows users to perform relevant bibliometric and visual analyses on an interactive web interface. Biblioshiny is an application suitable for team collaboration in bibliometrics analysis.

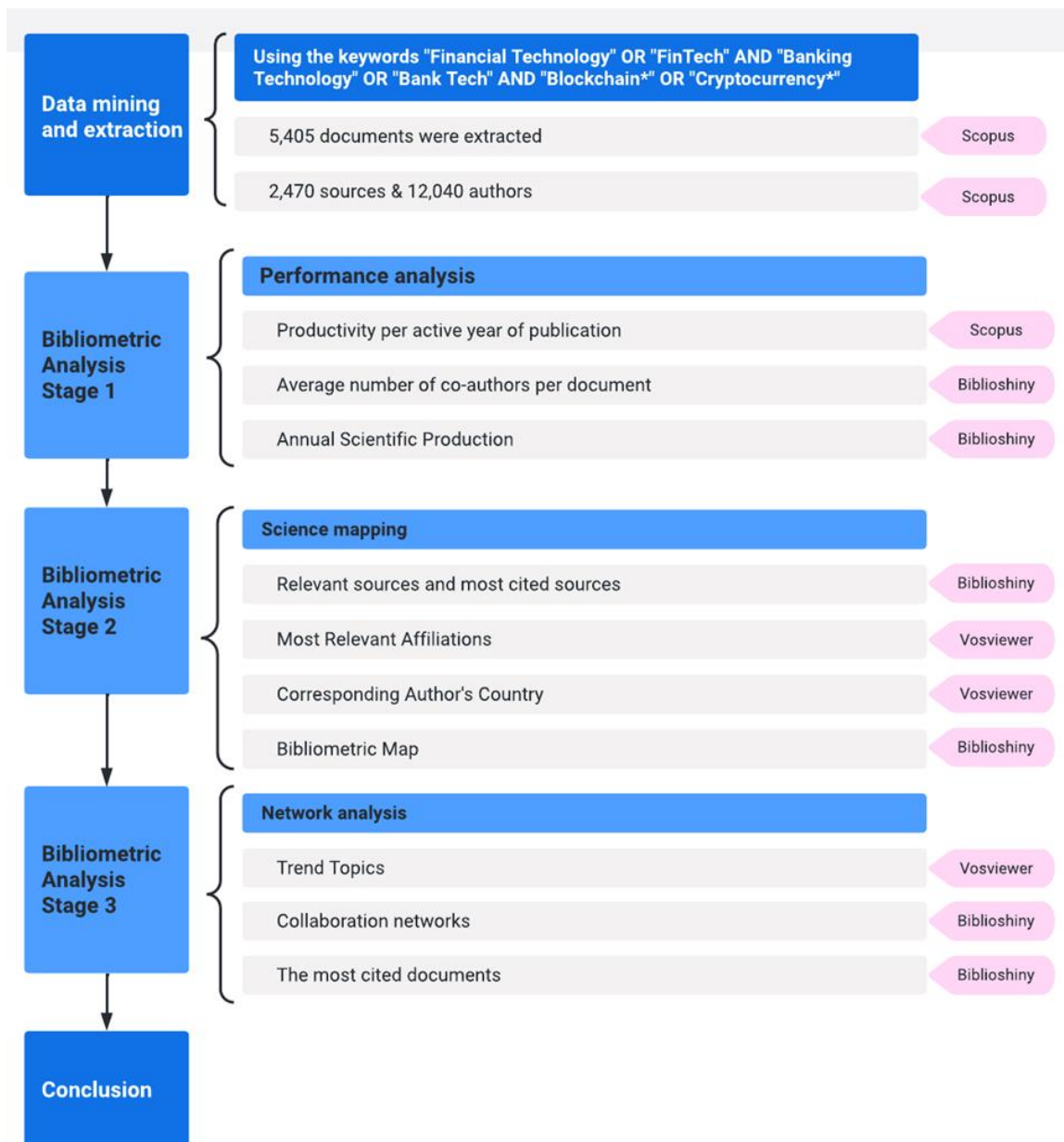
This research consists of 4 steps: data mining and extraction and three bibliometric analysis steps: performance analysis, science mapping, and network analysis. Details of each step of the study are as follows.

1. Data mining and extraction is collecting, analyzing, and extracting valuable information from the SCOPUS database. We use the keywords in the query statement: ["Financial Technology" OR

"FinTech" AND "Banking Technology" OR "Bank Tech" AND "Blockchain" OR "Cryptocurrency"]. The results are 5,405 documents from 2,470 journals and 12,040 authors.

2. The performance analysis method assesses the contribution of research factors, including authors, publications, and countries, to "The Evolution of Banking and Financial Technology" based on the number of relevant publications and citations. This stage can identify the most cited or productive journals, publications, and authors, providing insight into the research topic's significance, researchers, and journals. Findings obtained at this stage are productivity per active year of publication from SCOPUS, the average number of co-authors per document from Biblioshiny, and the number of annual scientific production from Biblioshiny.
3. The Science mapping approach stage illustrates how various research aspects related to the issue are interconnected. This stage utilizes citation and co-citation analysis, co-word, and co-authorship analysis, among other techniques, to identify the relationships between publications, fundamental themes, and connections between topics. The results of this step include Relevant and most cited sources analyzed by Biblioshiny, the number of most relevant affiliations, the corresponding author's country used by VOSviewer for visualization, and a bibliometric map visualized by Biblioshiny.
4. The network analysis stage utilizes metrics and clustering to visualize different outcomes. The results are trend topics mapping using VOSviewer, collaboration network mapping by Biblioshiny, and the summary of the most cited documents analyzed by Biblioshiny.

We will explain the details of the results above in the next section. The methodological steps involved in data extraction and bibliometric analysis are presented in Figure 1.

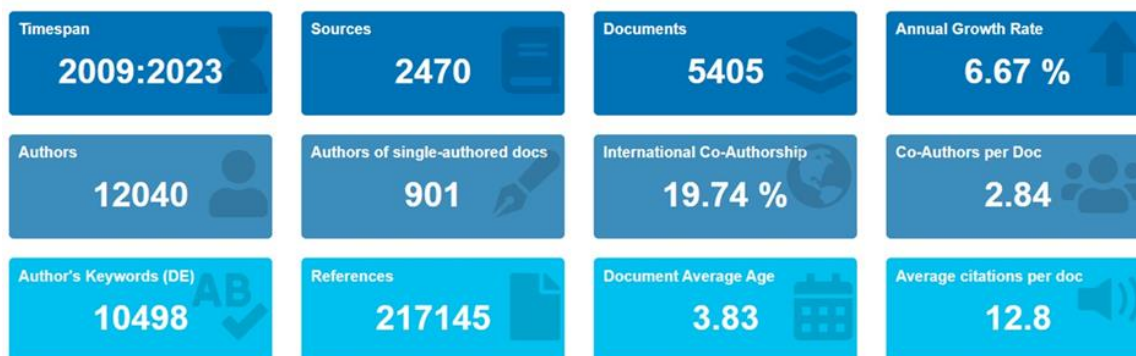


**Fig. 1. Stages of Bibliometric Analysis**

## RESULTS

### Performance analysis

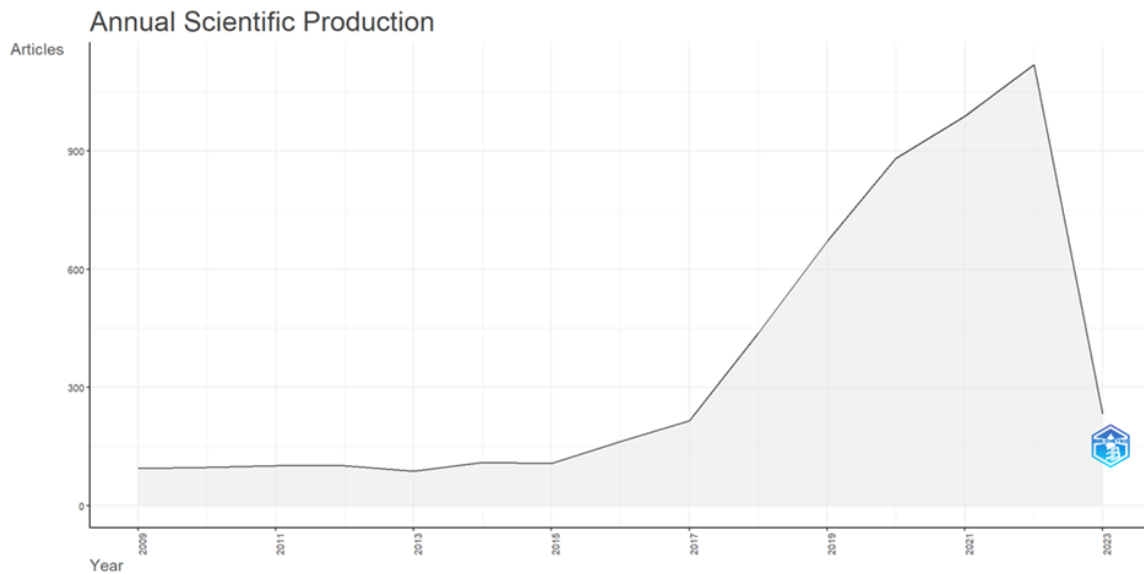
Between 2009 and 2023, the banking industry's statistical data demonstrated that researchers examined 5,405 documents from 2,470 sources, highlighting a considerable amount of academic research during that span. The documents exhibited a yearly growth rate of 6.67%, indicating a steady increase in research output. A total of 12,040 individuals contributed to the papers, with 901 producing singularly authored documents. Additionally, 19.74% of the documents displayed global collaboration, indicating international co-authorship among researchers.



**Fig. 2. Main Information of Dataset**

During the analyzed period, collaboration among researchers was prevalent, as the average number of co-authors per document was 2.84. The authors used a diverse range of 10,498 keywords (DE) to categorize their research, which indicates a broad scope of research topics. The documents received a total of 217,145 references, with an average citation of 12.8 per document, indicating a high level of recognition and impact of the research. The average age of the documents analyzed was 3.83 years, suggesting that the research reviewed was recent and current. In conclusion, the data highlights a significant increase in research output, with researchers collaborating on a wide range of topics. The high citation rate indicates that the research was well-received and impactful within the academic community (Figure 2).

Based on Figure 3, the number of publications in banking and financial technology was low in 2009. However, since then, there has been a consistent increase in the volume of papers. In 2022, the highest number of papers (1,119) was published, representing a substantial increase compared to previous years, such as 987 in 2021, 881 in 2020, and 671 in 2019. In 2018, there were 437 papers published, also showing a significant increase from earlier years. Overall, the data indicates a growing interest in banking and financial technology, with a surge in research activity in recent years. The Average Article Citations per Year data highlights a considerable variation in average citation among published articles in this field. Despite 2022 having the highest number of published articles (1,119), the average citation for that year was only 1.71. In contrast, 2017 had the highest mean total citation despite only having 216 publications, with a mean of 6.36 citations, suggesting that the articles published in 2017 had a significant impact on the field. Additionally, the mean citation per year for 2016 to 2020 is relatively high, indicating that publications during these years had a notable impact. Specifically, 2017 to 2018 had the highest mean citation at 5.36, followed by 2019 at 4.64, 2020 at 4.19, and 2016 at 4.07. These results suggest that researchers should focus on publishing papers that have the potential to make a significant contribution to the field and use the citation count as a measure of their research impact.



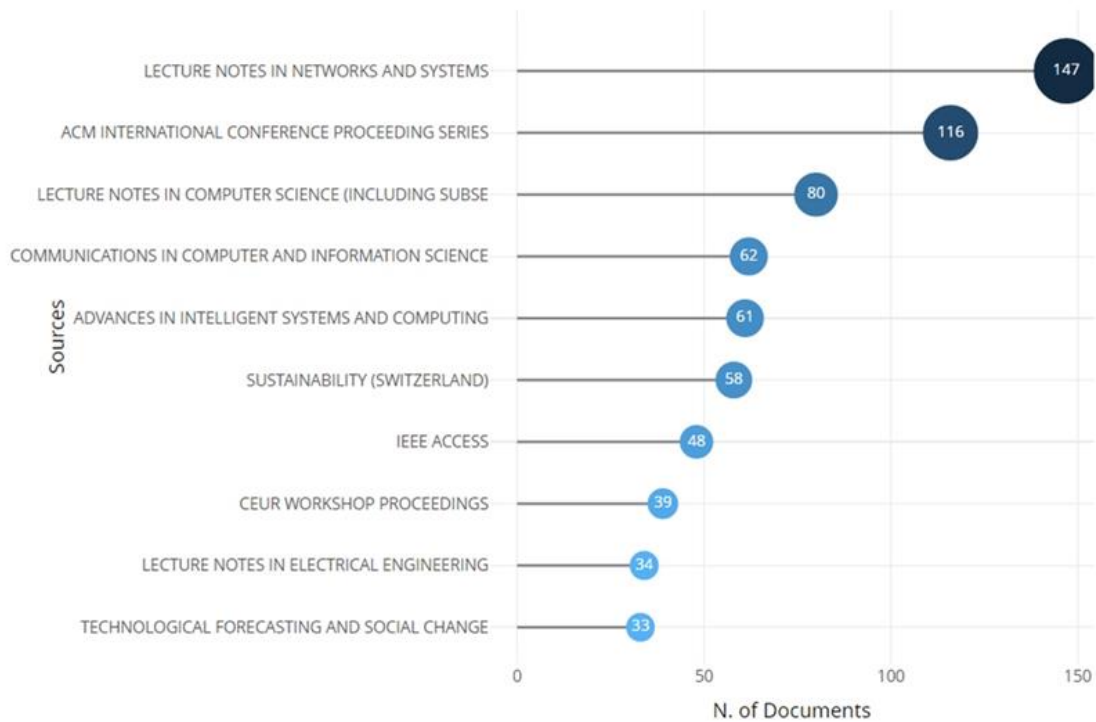
**Fig. 3. Annual Scientific Production**

### Science mapping

#### *Relevant sources and most cited sources*

The information presented in Figure 4 provides insight into the top 10 relevant sources in the field. The most commonly used source is Lecture Notes in Networks and Systems, with a total of 147 publications, indicating its high level of relevance in the domain. The second most commonly used source is the ACM International Conference Proceeding Series, with 116 publications, followed closely by Lecture Notes in Computer Science (including Subseries Lectures Notes in Artificial Intelligence and Lecture Notes in Bioinformatics) with 80 publications. Communications in Computer and Information Science is the fourth most commonly used source, with 62 publications, followed by Advances in Intelligent Systems and Computing with 61 publications. Based on the results, it can be inferred that these sources hold significant value in the domain and offer extensive information and understanding to researchers and practitioners. It is important to acknowledge that their recognition may be linked to their reputation, research quality, and wider accessibility. Consequently, this data can assist in directing future research and exploration, as well as facilitate the formation of innovative perspectives and notions within the field.

According to the data available, it can be inferred that IEEE Access is the most frequently referenced source in the field, with 1,576 citations, indicating its substantial impact and relevance. The International Journal of Bank Marketing closely follows with 1,467 citations, demonstrating its significant contribution to the knowledge base of banking and marketing. MIS Quarterly and International Journal of Information Management secured the third and fourth spots, respectively, with 965 and 835 citations. The Journal of Banking and Finance ranks fifth with 637 citations, indicating its importance in the field. Figure 5 visually presents this information, providing a clear depiction of the local citation rankings. These results suggest that researchers and practitioners value these sources as essential resources for their work and highlight the need to continue publishing high-quality research in these journals.



**Fig. 4. The Most Relevant Sources**

Table 1 presents information about several academic journals and conferences, as well as various indices used to assess their quality and impact. Among the listed elements, IEEE Access stands out with the highest H-index (19) and H5-index (41), indicating that it has a substantial number of highly cited articles. The International Journal of Bank Marketing, Technological Forecasting and Social Change, and Sustainability (Switzerland) have relatively high M-indices, which indicate the productivity of the authors. Sustainability (Switzerland) has the highest M-index (2.143), followed by Technological Forecasting and Social Change (2.000), suggesting that these journals are highly productive. Concerning total citations (TC), Sustainability (Switzerland) has the highest score (960), followed by the International Journal of Information Management (1,182). Finally, the oldest journal in the list is Technology in Society, established in 1989, while the newest ones are IEEE Access and Applied Sciences (Switzerland), both of which were launched in 2018.

**Table 1. The Source Local Impact**

Element	h_index	g_index	m_index	Total Citations	NP	PY_start
IEEE Access	19	41	3.167	1837	41	2018
International Journal of Bank Marketing	18	28	1.385	1170	28	2011
Technological Forecasting and Social Change	18	30	2.000	1358	30	2015
Sustainability (Switzerland)	15	30	2.143	960	46	2017
Lecture Notes in Computer Science (including Subseries Lectures Notes in Artificial	14	24	0.933	666	49	2009

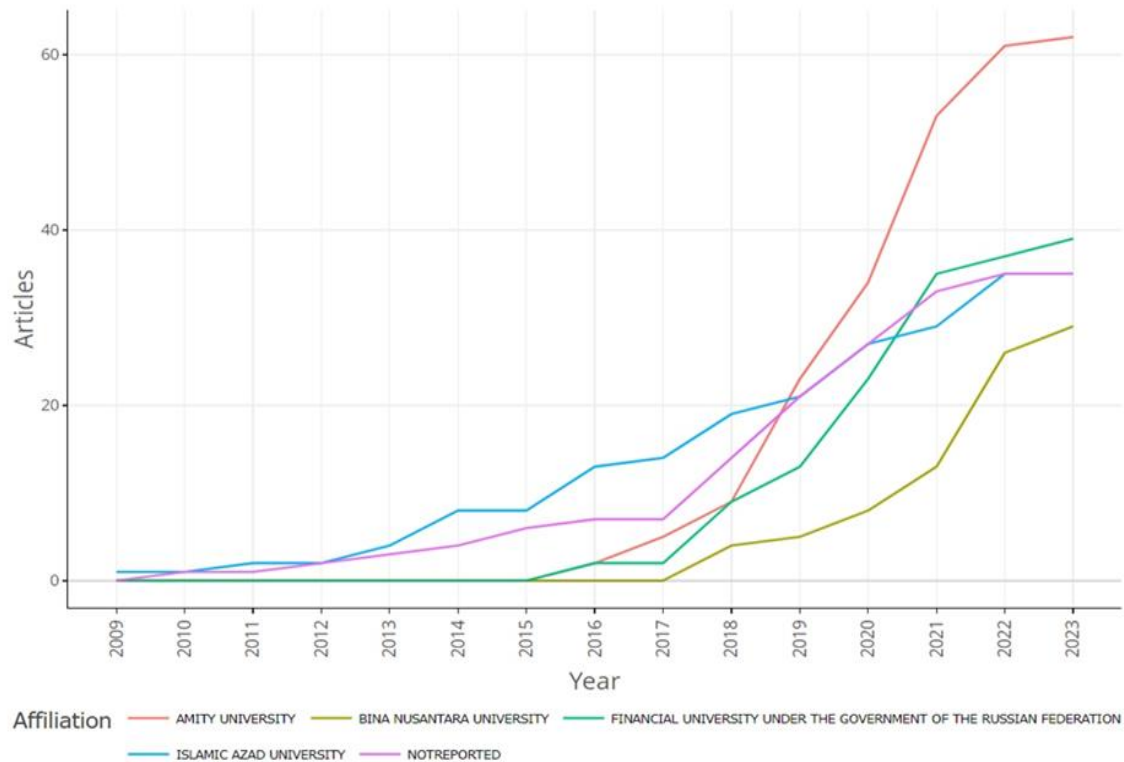
Intelligence and Lecture Notes in Bioinformatics)						
Journal of Internet Banking and Commerce	10	18	0.667	373	28	2009
Applied Sciences (Switzerland)	9	14	1.500	199	15	2018
International Journal of Information Management	9	9	0.692	1182	9	2011
Technology in Society	9	15	1.000	465	15	2015
ACM International Conference Proceeding Series	8	12	0.571	234	46	2010
IEEE Access	19	41	3.167	1837	41	2018

#### *Most productive authors*

The field of banking and financial technology is dominated by Na N.A. with 85 publications, followed by Wang H. with 27, Li Y. with 23, and Chen Y. and Wang X. with 22 publications each. This indicates that Na N.A. has made a significant contribution to the field with their extensive research. In addition, the number of local citations among the top five cited authors varies significantly. Rella L. has the highest number of citations, with 433 papers, followed by Wang H. with 281 papers, Chen X. and Zheng Z. with 263 papers each, and Xie S. with 259 papers. These results suggest that Rella L.'s work has been widely cited and has had a significant impact on the field of banking and financial technology.

#### *Most Relevant Affiliations*

The data presented in Figure 5 shows that Islamic Azad University and Notreported University have experienced a consistent increase in their publications since 2009. Similarly, Financial University Under The Government of the Russian Federation and Bina Nusantara University have shown an upward trend in their publications from 2015 and 2017, respectively. Amity University started publishing in 2016 and has become the top institution in the field with the highest number of papers published between 2019 and 2022. Moreover, most of the top authors in the field of banking and financial technology are affiliated with Amity University, with 62 published documents. Other notable contributors include authors affiliated with Financial University Under The Government of the Russian Federation (39), Islamic Azad University (35), Notreported University (35), and Bina Nusantara University (29). These results indicate that Amity University has established itself as a leading institution in the field, with a strong team of researchers and a substantial number of high-quality publications.



**Fig. 5. The Affiliations' Production over Time**

*Corresponding Author's Country*

Out of the total 2,616 articles, China has the highest number of publications with 530, followed by India with 361 publications. The United States and the United Kingdom have comparatively lower numbers of publications with 218 and 175, respectively. Similarly, Korea, Malaysia, Italy, Germany, and Australia have contributed even lower numbers of publications (Table 2).

**Table 2. Corresponding Author's Country**

Country	Articles (2616)	Single country publication (2223)	Multiple countries publication (393)	Freq (0.484)	MCP Ratio (0.150)
CHINA	530	435	95	0.098	0.179
INDIA	361	311	50	0.067	0.139
USA	218	153	65	0.040	0.298
UNITED KINGDOM	175	118	57	0.032	0.326
KOREA	101	79	22	0.019	0.218
MALAYSIA	99	75	24	0.018	0.242
ITALY	90	62	28	0.017	0.311
GERMANY	68	51	17	0.013	0.250
AUSTRALIA	67	50	17	0.012	0.254



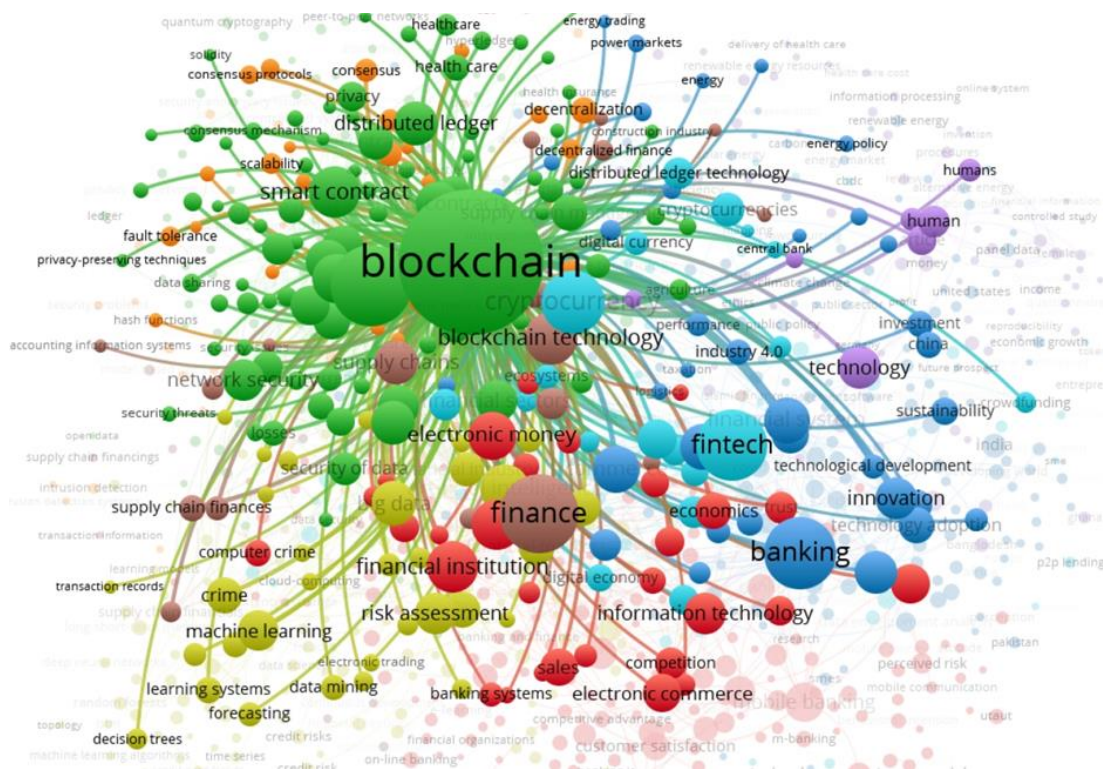
When considering the MCP ratio, which is the proportion of authors affiliated with the most common country of affiliation for an article to the total number of authors, the United Kingdom has the highest MCP ratio of 0.326, followed by the United States with a ratio of 0.298. China, which has the highest number of articles, has a lower MCP ratio of 0.179. This suggests that the United Kingdom and the United States have a higher concentration of authors with the same country affiliation compared to China. In conclusion, the data indicates that China and India are leading contributors to the articles published in this dataset, while the United Kingdom and the United States have a higher concentration of authors with the same country affiliation. However, it is worth noting that this dataset only represents a sample of publications, and the results may not be representative of the overall trends in academic publishing.

#### *Country Scientific Production and Most Cited Countries*

From the provided data, it appears that China and India have the highest frequency among the listed regions, with 1479 and 1422 occurrences respectively. The United States follows at a distant third with 864 occurrences, while the UK, Malaysia, Australia, Germany, Italy, Indonesia, and South Korea round out the bottom of the list. In addition, the dataset contains information about the number of citations and average article citations for ten different countries. China has the highest number of citations with 10,323, followed by the United Kingdom with 4,811 and the USA with 4,591. Sweden has the highest average article citations with an impressive 126.75, followed by Korea with 29.99 and Italy with 27.06. It is interesting to note that despite having the highest number of citations, China has a relatively low average article citation rate of 19.48, while India has the lowest average article citation rate of 8.27 despite having a moderate number of citations at 2,986. This dataset provides useful insights into the research productivity of different countries and can be used to identify trends and patterns in citation rates.

#### *Bibliometric Map*

Block chain is the most frequent word (Figure 6) that appears in various criteria, such as word cloud, tree map, and trend topics. Based on the analysis of the given dataset, "blockchain" is the most frequently occurring word with 1,320 mentions, followed by "block-chain" with 599 mentions. This suggests that the topic of blockchain technology is currently a popular and relevant subject in various fields, including finance, banking, electronic money, and the internet of things. It is worth noting that the trend towards blockchain technology is also reflected in the increasing number of citations in scholarly articles, with China leading the pack with 10,323 citations, followed by the United Kingdom with 4,811 and the United States with 4,591. This suggests that blockchain technology is not only a buzzword but also a topic of academic interest and research in different parts of the world.

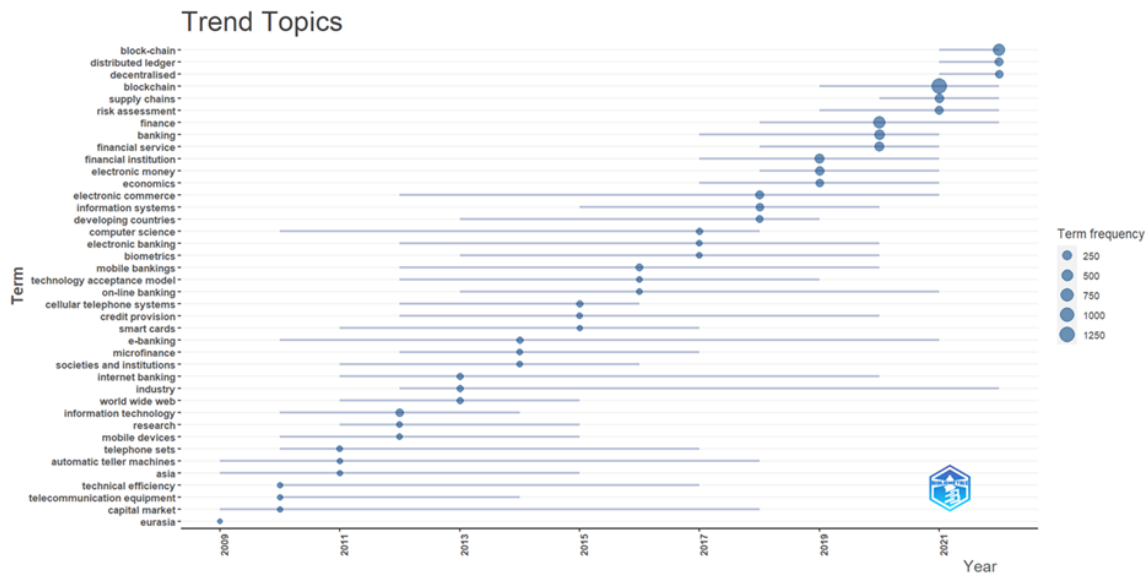


**Fig. 6. The Most Frequent Words shown in Bibliometric Map**

## **Network analysis**

### *Trend Topics*

The given data shows the trend topics and their frequency from the years 2009 to 2022. The most popular topic is blockchain, with a frequency of 1,320, and it has been consistently popular over the years. The use of "block-chain" has also emerged as a popular term with a frequency of 599, indicating that the term is being used interchangeably with "blockchain." Finance is the next most popular topic with a frequency of 528, and it has seen consistent interest over the years. Banking and financial institutions are also popular topics, with frequencies of 324 and 220, respectively. Electronic money and financial services have seen a steady rise in interest since 2018, with frequencies of 200 and 220, respectively. Supply chains have a frequency of 163, indicating growing interest in the topic, while risk assessment has a frequency of 150, indicating that it has also been a popular topic. Finally, distributed ledger has a frequency of 127, indicating that it is also gaining popularity as a topic of interest (Figure 7). Overall, the data suggests that blockchain and related topics, as well as finance and banking, are popular and have gained a lot of attention in recent years.



**Fig. 7. The Trend Topics Based on Keywords**

### *Collaboration networks*

Collaborative research efforts can lead to advancements in many fields, and the collaboration word map provided highlights the frequency of international collaborations in different regions. The data shows that China has collaborated with the US and the UK the most, with 70 and 36 collaborations respectively. Meanwhile, the US and the UK have also worked together frequently, with 35 collaborations. India has collaborated significantly with Saudi Arabia, the US, and the UK, with 26, 21, and 20 collaborations, respectively. Other notable collaborations include those between China and Hong Kong, China and Pakistan, and the US and Canada, each with 19 collaborations. By analyzing these patterns, researchers can identify potential opportunities for future collaborations, leading to more innovative research and advancements in different fields.

### *The most cited documents*

The analysis shows that papers related to blockchain technology have received the highest number of citations in the list, indicating the growing interest in this field. The paper titled "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends" has the highest number of citations at 2,097, followed by "Blockchain challenges and opportunities: A survey" with 1,511 citations, and "Blockchain technology in the energy sector: A systematic review of challenges and opportunities" with 1,112 citations. These findings suggest that blockchain technology is a rapidly growing area of research, with many scholars exploring its potential in different domains. The high citation count of these papers also indicates that the research findings are impactful and have significant implications for various stakeholders, such as policymakers, businesses, and academics (Table 3).

**Table 3. The top 5 documents with the most citations**

<b>Paper</b>	<b>Title</b>	<b>Source</b>	<b>Total Citations</b>	<b>Total Citations per Year</b>	<b>Normalized Total Citations</b>
Zheng, Z., Xie, S., Dai, H., Chen, X., & Wang, H. (2017)	An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends	IEEE International Congress on Big Data (BigData Congress)	2097	299.57	54.91
Zheng, Z., Xie, S., Dai, H. N., Chen, X., & Wang, H. (2018)	Blockchain challenges and opportunities: A survey	International Journal of Web and Grid Services	1511	251.83	56.41
Andoni, M., Robu, V., Flynn, D., Abram, S., Geach, D., Jenkins, D., ... & Peacock, A. (2019)	Blockchain technology in the energy sector: A systematic review of challenges and opportunities	Renewable and Sustainable Energy Reviews	1112	222.40	59.86
Lee, M. C. (2009)	Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit	Electronic Commerce Research and Applications	1085	72.33	34.41
Mengelkamp, E., Gärtner, J., Rock, K., Kessler, S., Orsini, L., & Weinhardt, C. (2018)	Designing microgrid energy markets: A case study: The Brooklyn Microgrid	Applied Energy	939	156.50	35.06

## DISCUSSION

This study analyzes the academic research output in the banking industry from January 2009 to 2023. The statistical data shows a steady growth rate of 6.67% per year, with more than 12,000 individuals contributing to the papers, and approximately 20% displaying international collaboration, highlighting the global nature of the industry. Collaboration among researchers was a common practice during the studied period, with an average of 2.84 co-authors per document, showing the importance of teamwork and knowledge sharing. The broad scope of research topics and the multidisciplinary nature of the industry are also emphasized, with 10,498 keywords used to categorize the research. The high number

of references received by the documents, with an average citation of 12.8 per document, indicates the impact and recognition of the research within the academic community.

The study also highlights the increasing interest in banking and financial technology, with a low number of publications in 2009 and a consistent increase since then. The significant increase in the number of papers published in 2022 indicates that the momentum of research activity is still growing. The analysis of the Average Article Citations per Year data shows that publications between 2016 and 2020 had a notable impact, with 2017 having the highest mean total citation. This suggests that researchers should focus on producing high-impact publications. Overall, the increase in research output in the banking industry is a positive development, leading to a better understanding of banking practices and contributing to the development of more effective policies and practices.

The most cited academic sources in the field are Lecture Notes in Networks and Systems, ACM International Conference Proceeding Series, Lecture Notes in Computer Science, Communications in Computer and Information Science, Advances in Intelligent Systems and Computing, IEEE Access, International Journal of Bank Marketing, MIS Quarterly, International Journal of Information Management, and Journal of Banking and Finance. These sources offer extensive information and understanding to researchers and practitioners and hold significant value in the domain. The data suggests that researchers and practitioners value these sources as essential resources for their work and highlight the need to continue publishing high-quality research in these journals. The quality and impact of academic journals and conferences can be assessed through various indices such as H-index, H5-index, M-index, and total citations (TC).

The analysis shows that Na N.A. is the most prolific author in the field of banking and financial technology, followed by Wang H., Li Y., and Chen Y. and Wang X. with a similar number of publications. This indicates that Na N.A.'s research has contributed significantly to the field. However, the number of local citations among the top five cited authors varies greatly, with Rella L. having the highest number of citations. This suggests that Rella L.'s work has been widely cited and has had a significant impact on the field of banking and financial technology. These findings highlight the importance of both quantity and quality of research in contributing to the advancement of a field.

The data shows that China has the highest number of publications in the field of study, with 530 articles, followed by India with 361 publications. On the other hand, the United States and the United Kingdom have a lower number of publications with 218 and 175, respectively. Additionally, the countries with even lower numbers of publications are Korea, Malaysia, Italy, Germany, and Australia. These findings are slightly different from those of Galletta et al. (2022), concerning the environmental, social, and governance factors in banking between 1986–2021 on Web of Science that indicated the top five countries with the highest documents and citations being the USA, China, Spain, England, and Italy.

The MCP ratio, which indicates the proportion of authors affiliated with the most common country of affiliation for an article to the total number of authors, reveals interesting findings. The United Kingdom has the highest MCP ratio of 0.326, followed by the United States with a ratio of 0.298. However, China, despite having the highest number of articles, has a lower MCP ratio of 0.179, suggesting that there is a greater diversity of author affiliations in China.

The two bibliometric maps reveal the significant interest in blockchain technology in various fields, including finance, banking, electronic money, and the internet of things. The high frequency of the term "blockchain" and "block-chain" suggests that this technology has captured the attention of scholars, researchers, and practitioners alike. Moreover, the increasing number of citations in scholarly articles across different parts of the world reflects the growing academic interest in blockchain technology. The trend topics map highlights the consistent popularity of blockchain technology as the most popular topic, with finance, banking, and electronic money following closely behind. These

findings are consistent with previous studies of the application of blockchain technology in banking and finance research (Gan et al., 2021; Pal et al., 2021; Patel et al., 2022). The steady rise in interest in electronic money and financial services since 2018 also indicates a growing trend towards digitization in finance. Overall, the bibliometric maps reveal the current trends and future directions in the field of blockchain technology and its potential impact on various industries. In other words, the Campos-Teixeira and Tello-Gamarra (2022) mentioned six topics in Fintechs since 1991-2020, including 'banking and financial services', 'electronic services', 'e-finance', 'consumer behaviour', 'mobile services', 'risk' and 'cryptocurrency'.

The findings of this study have significant implications for the future of research in the banking industry. The steady growth in research output, international collaboration, and multidisciplinary nature of the industry indicate that researchers will continue to explore new avenues of inquiry and expand their understanding of banking practices. The increasing interest in financial technology and blockchain technology also suggests that future research will focus on the digitization of finance and its impact on the industry. The identification of the most cited academic sources and prolific authors provides a roadmap for future researchers and practitioners to follow and build upon. The bibliometric maps also offer valuable insights into current trends and future directions in the field, highlighting potential areas of growth and innovation. While this research provides valuable insights, it is important to note the limitations. One of the major limitations is the reliance solely on SCOPUS as the data source. There are other academic databases, such as Web of Science, which may contain relevant publications not included in SCOPUS. Thus, the study's findings may not be representative of the entire body of academic literature on the subject. Another limitation is the time range analyzed. Although the study covered a significant period from 2009 to 2022, there may have been earlier or more recent developments in the field not included in the analysis.

Future research can address these limitations by expanding the time range beyond 2009 to 2022 to gain a more comprehensive understanding of the field's evolution. Additionally, it is recommended that future research focuses on several trending topics that have emerged in recent years, such as distributed ledger technology, electronic money, and financial services. Given the consistent popularity of blockchain, future research should explore its implications, including its impact on industries like finance, healthcare, and logistics. In conclusion, future research should continue to explore these topics and other emerging technologies to advance our understanding of their potential and limitations.

## **CONCLUSION**

This study analyzed the academic research output in the banking industry from January 2009 to March 2023. A total of 5,405 documents from 2,470 sources were examined, indicating a steady increase in research output. The study also found that collaboration among researchers was prevalent, with an average of 2.84 co-authors per document. The authors used a diverse range of 10,498 keywords to categorize their research, indicating a broad scope of research topics. The documents received a total of 217,145 references, with an average citation of 12.8 per document, indicating a high level of recognition and impact of the research. The findings suggest that there has been a growing interest in the area of banking and financial technology, with a surge in research activity in recent years. The study also identified the most commonly used and highly valued sources in the field, and the most widely cited sources. Finally, the study provided a table that lists academic journals and conferences along with various indices used to evaluate their quality and impact.

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# Exploring the Topic Structure and Evolutionary Trends of Health Information Behaviour Research in Library and Information Science: Bibliometric Analysis

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## ABSTRACT

Health information behaviour (HIB) pertains to the manner in which individuals actively search for and employ information to address their health status. Library and Information Science (LIS) is an interdisciplinary field focused on information processes and operations. HIB extends beyond information interaction and encompasses both the social and personal dimensions of individuals' perception and understanding of health. Therefore, this study aims to explore the development and topic structure of HIB in LIS research field from WoS using bibliometric analysis and network visualization. A total of 1,042 research publications in LIS were retrieved and analyzed. The dataset was examined using bibliometric techniques, which included publication performance analysis and science mapping. The findings show that the HIB in LIS research trends has been increasing. In 2021, the HIB topic reached the peak with 117 articles. Zhang Y. is the top author with 16 papers, and receives the highest citation on consumer health information needs. The major HIB research topics in LIS are 14 clusters include covid-19 pandemic, cervical cancer, systematic review, health information, information horizon, and etc. This paper provides the research landscape of HIB research in LIS field and offers the research frameworks in the field.

**Keywords:** Health information behaviour, Bibliometrics, Library and Information Science, Topic analysis

## INTRODUCTION

The societal transformations and the prevalence of disease outbreaks have affected human living, including healthcare practices. Health information behaviour (HIB) encompasses diverse approaches individuals employ to obtain and acquire healthcare-related information. The global impact of the



COVID-19 pandemic resulted in a halt to global mobility and social interactions. Thus, individuals actively seek out sources of information to educate themselves about the disease and navigate their daily lives. The confluence of disease pandemics and the rapid global population growth, particularly with an aging demographic, exerts a substantial impact on economies, societies, and healthcare systems. Consequently, the elderly, as well as individuals living in poverty, are unable to maintain a safe living environment (Song et al., 2018). However, the emergence of the information and technology age has brought people to maintain their health in daily life and prevent and treat diseases (IMS, 2014). The availability of diverse health information worldwide has the potential to bridge the gap between patients and medical professionals, enabling individuals to effectively manage and maintain their health status. Therefore, HIB plays a vital role in promoting well-being, as it allows individuals to access and shared health contents as well as their health and illness statuses on social media platforms. Furthermore, HIB extends to question-and-answer applications where individuals seek advice from medical experts, further contributing to the enhancement of their health knowledge and decision-making processes.

In line with the United Nations Development Programme's Sustainable Development Goals (SDGs), the goal of good health and well-being (SDG 3) is crucial. (United Nations Development Programme, 2023). It aims to address mental health concerns, ensure access to healthcare services, information, and education, provide financial risk protection, and ensure access to safe, effective, and quality essential medicines. To support and achieve this goal, the study and promotion of HIB should be studied and promoted.

In LIS field, information behaviour (IB) has evolved into a fundamental field of study that examines the interaction between human beings and information, encompassing the processes of information seeking and utilization (Bates, 2010). Consequently, numerous topics of IB research have been generated and explored. The study of information behavior (IB) examines the relationship between individuals, society, and information, encompassing a wide range of contexts within this field of research. Likewise, specific information behaviors such as Health Information Behavior (HIB) have encompassed various contexts associated with disciplines such as Library and Information Science (LIS), health, medicine, and other relevant fields. Although several topics of HIB have been studied, they focused on specific issues. Therefore, this study proposed to explore the landscape of topics structured in research publications and to examine the HIB research trends in the LIS field.

In the text-mining research field, there are several techniques to detect hidden information structured in massive documents. Bibliometric analysis is the one approach to examine and identify the research topics, evolution trends, and scholarly community networks in a specific field (Zhang et al., 2019). It is a quantitative analysis, which is utilized in the study of scientific citations (Yang et al., 2019). Bibliometric analysis can visualize the knowledge structure within scientific networks and identify emergent disciplinary fields (Chen & Song, 2017).

Several previous studies applied the bibliometric analysis to investigate the topic and knowledge structured in specific fields such as a study on mental health diseases (Sabe et al., 2022; Timakum et al., 2022), telemedicine and electronic health (Nwagwu et al., 2022; Sikandar et al., 2021), environmental and social science (Zhao et al., 2023), and critical thinking in education (Timakum et al., 2022). In the health information behaviour research area, bibliometrics has also been utilized to identify trends and prevalent research topics, for example, the study on internet health information-seeking behaviour (Li, 2015), emotional intelligence relations with self-management and health information seeking (Gurung, 2022), and health information behaviour hotspots and evolutions (Zhu, 2022).

Consequently, this paper aimed to analyze the bibliographic information for exploring the development of HIB research in the LIS field. Our objective was to present the research publication performance, and identify topic clusters and their co-occurrence networks. We anticipated that this study would enhance the comprehension of Health Information Behavior (HIB) in relation to diverse research domains. Furthermore, it has the potential to facilitate future research endeavors by providing valuable insights. Additionally, the research framework employed in this study can be applied to other fields of research to elucidate pertinent topic concepts. In particular, this study was designed to answer, 1) What is the HIB in LIS research publication development trends? 2) What are the research topic clusters of HIB in LIS research? 3) What is the authors' association network?, and 4) What is the keywords association network?

## **LITERATURE REVIEW**

### **Health information behaviour**

Health information behavior pertains to how individuals search for, obtain, assess, and utilize health-related information to make informed choices about their well-being (Lambert & Loiselle, 2007). It encompasses various elements including information requirements, sources, accessibility, assessment, and utilization. Personal factors (e.g., demographics, health status, knowledge), information sources (e.g., healthcare professionals, the internet, social networks), and contextual factors (e.g., culture, education, socioeconomic status) influence health information-seeking behavior (Johnson, 2014). People often seek health information in response to health concerns, for health maintenance, or to prevent future issues. The internet has become a primary and convenient source of health information due to its convenience and accessibility (Lorence et al., 2006).

Online health communities have gained prominence as platforms where individuals can find support, share experiences, and exchange health-related information. These communities foster a sense of belonging, emotional support, and learning opportunities from peers who have encountered similar health challenges (Frost & Massagil, 2008). Actively participating in online health communities can positively impact health outcomes by increasing knowledge, self-confidence, and adherence to treatment plans (Van Uden-Kraan et al., 2008).

Overall, comprehending health information behavior is crucial for healthcare providers, policymakers, and information providers to develop effective strategies that meet individuals' health information needs, enhance health literacy, and promote informed decision-making in healthcare.

### **Bibliometrics**

Bibliometrics is a research discipline that focuses on the quantitative analysis of scientific publications, citations, and other bibliographic data to discern patterns, trends, and connections within scholarly literature. Bibliometrics involves the application of statistical and mathematical methods to analyze publications, authors, journals, and other bibliographic entities. It provides insights into the structure and dynamics of scientific knowledge (Egghe, 2005). Key bibliometric indicators include citation counts, h-index, journal impact factors, and co-authorship networks. These metrics are utilized to evaluate the impact, visibility, and productivity of researchers, institutions, and scientific disciplines (Bornmann & Leydesdorff, 2014).

Citation analysis, a widely utilized bibliometric technique, investigates citation patterns in scientific literature to identify influential papers, authors, journals, and the intellectual structure of a research field (Noyons, 1999). Various citation indicators, such as citation counts, citation impact, and

co-citation analysis, are employed to assess the impact and visibility of individual researchers, research groups, and institutions (Boyack & Klavans, 2010; Liu, 2014).

Co-authorship analysis examines the collaborative patterns among researchers by analyzing the co-authorship relationships within publications. It helps understand the social structure and dynamics of research communities (Li et al., 2013). Co-authorship networks can provide insights into research collaborations, knowledge diffusion, and the identification of key researchers or research groups in a specific field. They are often used to evaluate research productivity and collaboration patterns. (Abbasi et al., 2011; Hu & Racherla, 2008).

The open science movement has had an impact on bibliometrics by advocating for greater transparency, reproducibility, and accessibility of research. Open-access publishing, preprints, and data sharing practices have implications for bibliometric analysis and the evaluation of research impact (Bornmann & Mutz, 2015). Bibliometrics continues to evolve as a field, with new methods and approaches emerging to address the changing landscape of scholarly communication and research evaluation. It provides valuable insights for researchers, policymakers, and institutions to understand and evaluate the scientific literature and its impact.

### **Co-occurrence analysis**

Co-occurrence analysis is a quantitative method employed to identify patterns of co-occurrence or co-occurrence relationships between terms, concepts, or entities within a corpus of literature. It reveals meaningful associations and relationships among various elements within a research field. Co-occurrence analysis involves identifying the frequency and strength of associations between terms based on their shared occurrence within a body of text. This method can be applied to various types of textual data, including scientific literature, social media posts, and web content (Mihalcea & Radev, 2011). The primary objective of co-occurrence analysis is to reveal underlying structures, semantic relationships, and thematic patterns in a collection of documents, enabling researchers to gain insights into the research topics, trends, and knowledge domains within a specific field (Hunter, 2014; Su et al., 2010).

Co-occurrence analysis often involves constructing co-occurrence networks, where terms or entities are represented as nodes, and co-occurrence relationships are depicted as edges between nodes. Co-occurrence networks provide visual representations of the relationships between terms or entities, enabling researchers to identify key concepts, central themes, and communities within a research field (Radhakrishnan et al., 2017).

Co-occurrence analysis has been used in various research areas, including bibliometrics, text mining, and knowledge discovery. It has been applied to uncover research trends, identify research collaborations, extract keywords, and discover latent knowledge structures within scientific literature (Small, 1999). Researchers consider it a powerful tool for exploring and uncovering hidden patterns and relationships within textual data. By revealing co-occurring terms and entities, it assists in identifying important concepts, understanding thematic structures, and generating valuable insights in various domains.

## **MATERIALS AND METHODS**

### **Data collection**

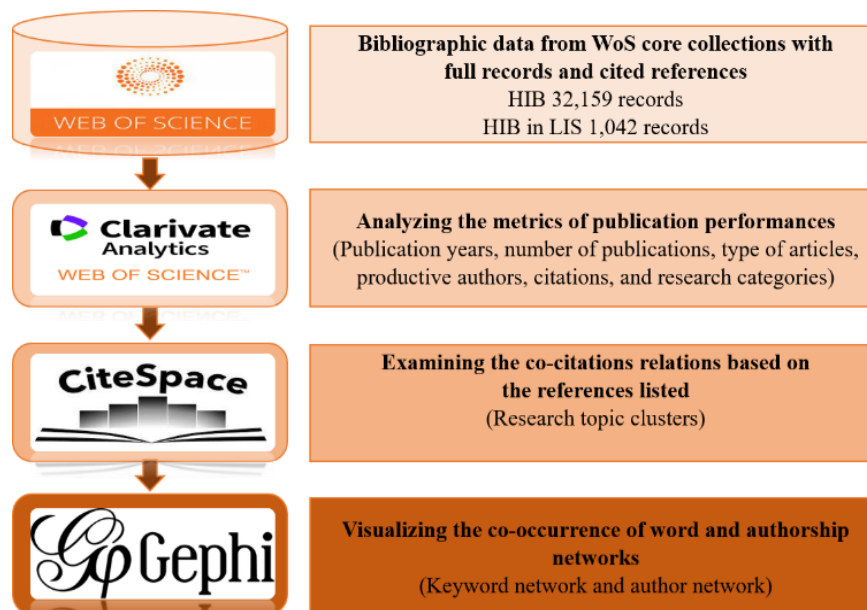
To conduct this study, the relevant bibliographic data from WoS core collections with full records and cited references were collected. The HIB search term and criteria included “*health information behaviour*” (Abstract) OR “*health information behaviour*” (Author Keywords) OR “*health information*

*behaviour*” (Keyword Plus ®) OR “*health information behaviour*” (Title). The search result showed 32,159 records that were published from 1986 to 2023. However, we narrowed down our focus by utilizing *Information Science Library Science (Web of Science Categories)* to refine our research parameters. Finally, a total of 1,042 publications in the field of library and information science research focusing on health information behavior were selected for analysis. The findings unveiled a range of publication years spanning from 1993 to 2023, with data retrieved as of March 1, 2023.

### Data processing

The bibliometric analysis was performed using WoS Clarivate analytics (Clarivate, 2022) and CiteSpace.6.2.R3 Advanced (Chaomei, 2016). The Gephi 0.9.2 (Gephi, 2022) was applied to visualize the network. The experiments are explained as follows:

Firstly, the WoS Clarivate analytics was employed to analyze the metrics of publication performances including the publication years, number of publications, type of articles, productive authors, citations, and research categories. This process was applied to answer the RQ.1. Secondly, CiteSpace was employed to examine the co-citations relations based on the references listed at the end of the articles (Chen & Song, 2017), and to explore the research topic clusters structured in scientific literature. Moreover, CiteSpace was applied to analyze the co-word and co-authorship in the documents. The experiment was conducted to answer the RQ. 2-4. Finally, the Gephi was utilized to visualize the co-occurrence of word and authorship networks in order to answer the RQ. 4. The research framework is shown in Figure 1.



**Fig. 1. Research framework**

## RESULTS AND DISCUSSIONS

### Research publication development trends and citation counts

Based on the 32,159 records of WoS data analysis using the Clarivate analytics tools, the number of studies in HIB has been increasing steadily. In 2022, there were 3,485 papers published in this research field. The WoS categories analysis shows the top 10 research fields in HIB included Public Environmental Occupational Health (7,684), Health Care Sciences Services (2,766), Medicine General

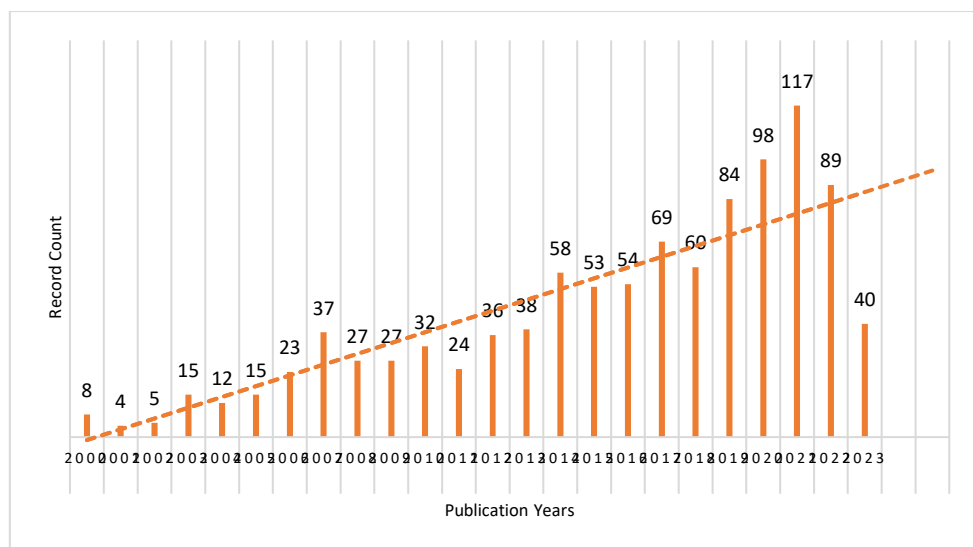
Internal (2,198), Psychiatry (1,689), Medical Informatics (1,606), Health Policy Services (1,453), Environmental Sciences (1,388), Nursing (1,125), and Library Science and Information Science (1,042).

With 1,042 records of HIB in LIS, the analysis shows that the number of publications has been increased, notably, in 2021, it reached the peak at 117 records, as depicted in Figure 2. The top five publication types were the research article with 923 records, followed by proceeding paper (87), review article (63), early access (47), and book review (8). Among 1,042 records, we found 910 publications related to sustainable development goals (SDGs). The papers were classified into the goal of good health and well-being 654 records, quality education 200 records, gender equality 28 records, industry innovation and infrastructure 14 records, and climate action 14 records.

The top five journals that published this research field included the Journal of Health Communication with 237 papers, the Health Information and Libraries Journal (93), the Journal of the American Medical Informatics Association (70), the Journal of Documentation (37), and the Journal of the Association for Information Science and Technology (30), respectively.

The top productive author in the field of Health Information Behavior (HIB) research within the LIS domain is Zhang, Y., who has published 16 papers. One of his notable works is the article titled *"Consumer health information needs: A systematic review of measures."* Additionally, Fourie, I. (13) and Eriksson-backa, K. (9) are also prominent authors in this field, with two other authors displayed in Table 1.

Furthermore, the findings indicate that the most cited article in the LIS research area, using the CiteSpace tool, is titled *"Systematic review of home telemonitoring for chronic diseases: the evidence base"* by Paré, G., Jaana, M., & Sicotte, C., with a total of 490 citations. This is followed by *"The health information national trends survey (HINTS): development, design, and dissemination"* by Nelson, D. et al., which received 460 citations. Additionally, *"Health information seeking behaviour"* by Lambert, S. D., & Loiselle, C. G. garnered 458 citations, as illustrated in Table 2.



**Fig. 2. Publication years of HIB research in the LIS field**

**Table 1. Top five productive authors in the HIB research in the LIS field**

Author	Publication count	Paper source	Citations
Zhang, Y.	16	Pian, Wenjing, Shijie Song, and Yan Zhang. "Consumer health information needs: A systematic review of measures." <i>Information Processing &amp; Management</i> 57.2 (2020): 102077.	39
Fourie, I.	13	Fourie, I. (2009). Learning from research on the information behaviour of healthcare professionals: a review of the literature 2004–2008 with a focus on emotion. <i>Health Information &amp; Libraries Journal</i> , 26(3), 171-186.	29
Eriksson-backa, K.	9	Eriksson-Backa, K. (2008). Access to health information: perceptions of barriers among elderly in a language minority. <i>Information Research</i> , 13(4), 13-4.	21
Nicholas, D.	9	Nicholas, D., Huntington, P., Williams, P., & Dobrowolski, T. (2004). Re-appraising information seeking behaviour in a digital environment: Bouncers, checkers, returnees and the like. <i>Journal of Documentation</i> , 60(1), 24-43.	47
Moser, R.P.	8	Viswanath, K., Breen, N., Meissner, H., Moser, R. P., Hesse, B., Steele, W. R., & Rakowski, W. (2006). Cancer knowledge and disparities in the information age. <i>Journal of health communication</i> , 11(S1), 1-17.	205

**Table 2. Top five cited papers of HIB research in the LIS field with the highest citations**

Citation count	Cited paper source
490	Paré, G., Jaana, M., & Sicotte, C. (2007). Systematic review of home telemonitoring for chronic diseases: the evidence base. <i>Journal of the American Medical Informatics Association</i> , 14(3), 269-277.
460	Nelson, D., Kreps, G., Hesse, B., Croyle, R., Willis, G., Arora, N., ... & Alden, S. (2004). The health information national trends survey (HINTS): development, design, and dissemination. <i>Journal of health communication</i> , 9(5), 443-460.
458	Lambert, S. D., & Loiselle, C. G. (2007). Health information—seeking behaviour. <i>Qualitative health research</i> , 17(8), 1006-1019.
252	Shim, M., Kelly, B., & Hornik, R. (2006). Cancer information scanning and seeking behaviour is associated with knowledge, lifestyle choices, and screening. <i>Journal of Health Communication</i> , 11(S1), 157-172.
207	Rutten, L. J. F., Squiers, L., & Hesse, B. (2006). Cancer-related information seeking: hints from the 2003 Health Information National Trends Survey (HINTS). <i>Journal of health communication</i> , 11(s1), 147-156.

The analysis results of HIB research development and trends demonstrate that scholars in this research field have shown particular interest in topics related to medical and health care services, encompassing both physical and mental care, as well as medical informatics. Library and Information Science (LIS) also emerges as a significant research category in the study of HIB, with a noticeable increase in publication trends each year. Notably, in 2021, the number of HIB papers published in the LIS field reached its peak with 117 records. This surge in research activity may be attributed to the Covid-19 pandemic, which heightened the need for health-related information and prompted researchers to seek effective solutions to support individuals. Furthermore, the findings reveal that papers focusing on information behavior theories, telemedicine, and cancer information-seeking garnered frequent references from researchers in this field. Additionally, the majority of previous studies within the SDGs category aligned with the goal of promoting good health and well-being

## Topic structure and evolution

CiteSpace software analyzed the node type of dataset including the author, *keyword*, and reference from 2000 to 2023. The label clusters were visualized by the indexing terms (*Keywords*). Each cluster connected components of the network by cited references, which were also used for measuring the size of the cluster. Each cluster was computed by the size of paper members (*S*) and a silhouette value (*S<sub>i</sub>*) (Chen, 2014). A silhouette value is a combination of two scores of cohesion and separation which measures how the similarity of an object is to its own cluster or to other clusters. In other words, it measures the quality of a clustering configuration.

## Health information behaviour research (HIB) topic clusters

Out of the 32,159 HIB research publications, the CiteSpace software identified a total of 205 topic clusters. The 17 major topic clusters were displayed in Figure 3, including clusters #0 covid-19 pandemic, #1 systematic review, #2 health information, #3 social media, #4 online health information, #5 physical activity, #6 internet use, #7 psychological issue, #8 smoking cessation, #9 preschool children, #10 pandemic influenza, #11 covid-19 vaccine, #12 genetic information, #13 intermittent preventive treatment, #14 google trends research, #15 scoping review, and #16 longitudinal analysis.

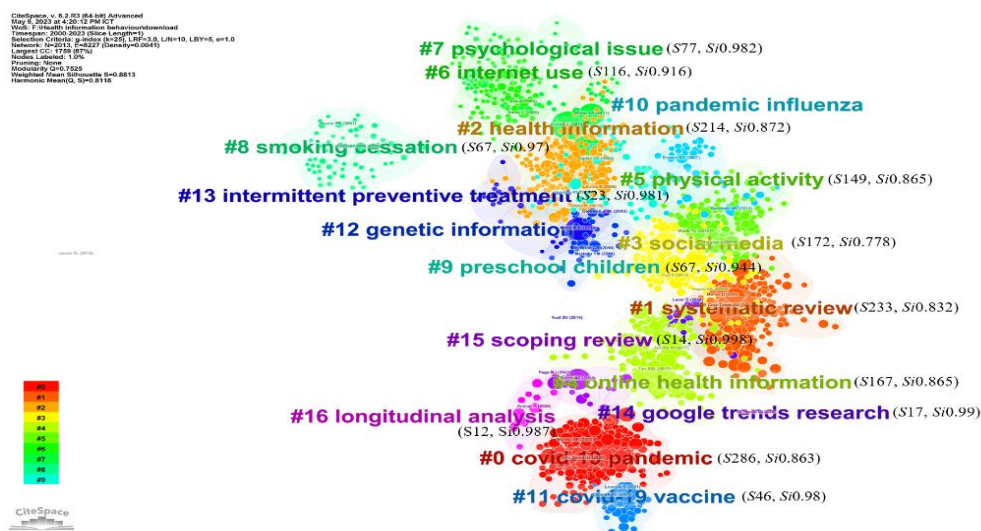


Fig. 3. Landscape of health information behaviour research topic clusters

Based on the results, we can conclude that the primary topics within the health information behavior (HIB) research domain are closely related to the Covid-19 pandemic and chronic diseases, including cancer, heart disease, and stroke. Additionally, HIB researchers have shown a significant focus on areas such as online health information-seeking behavior, mobile health technologies, electronic health platforms, research methodologies, and physical activity programs.

## Health information behaviour in LIS research (HIB in LIS) topic clusters

With 1,042 records of HIB in LIS, the result shows the topic clusters structured in the health information behaviour in the library and information science research field in 176 clusters. The 14 major clusters were identified and included the topics of #0 covid-19 pandemic, #1 cervical cancer, #2 systematic review, #3 health information, #4 information horizon, #5 seeking behaviour, #6 open access, #7 colon cancer, #8 disengaged at-risk populations insight, #10 health behaviour, #11 personal cancer



knowledge, #12 New Zealander, #15 gather interface, and #16 infodemiology approach as shown in Figure 4.

Additionally, the timeline analysis result of each topic was presented in Figure 5, depicting the trends and timelines associated with each topic. It is evident that topics concerning health information and disengaged at-risk populations have been studied since 2000 and remain relevant to the present time. Other active topics that have garnered recent interest from researchers include the Covid-19 pandemic, systematic review, and information-seeking behavior.

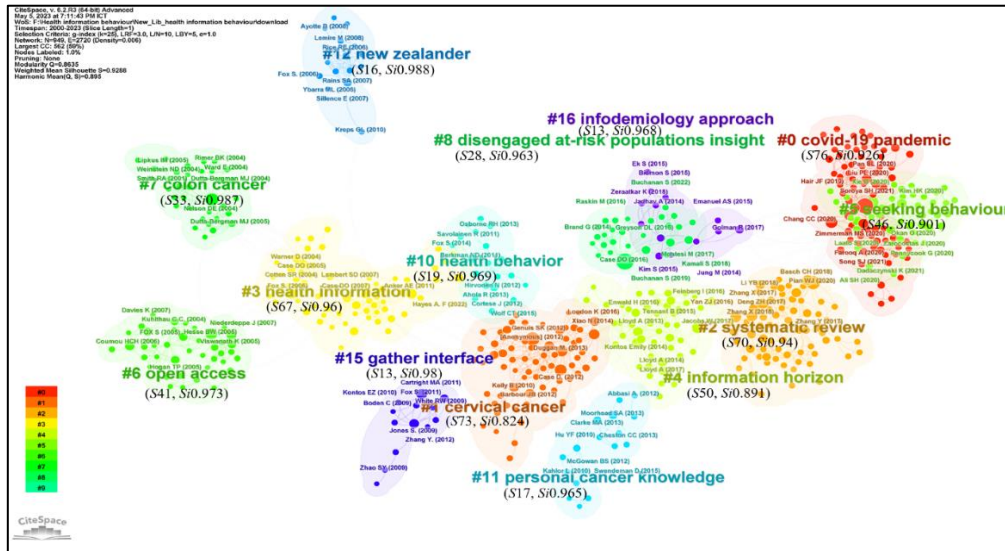


Fig. 4. Landscape of HIB in LIS research topic clusters

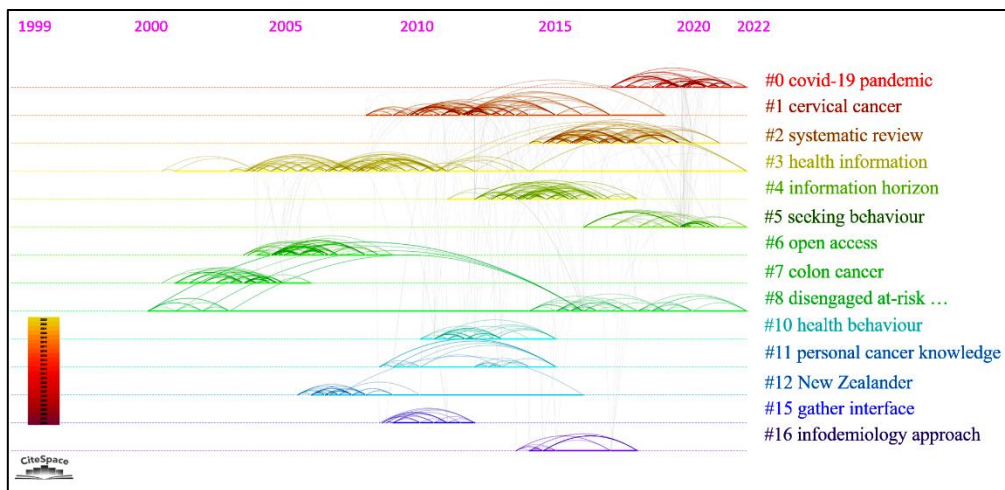


Fig. 5. Landscape of HIB in LIS research topic clusters

Based on the results, it is evident that researchers in the LIS field have shifted their focus toward health information behavior in relation to the Covid-19 pandemic, health information-seeking behaviour, and risk populations insight. However, they continue to draw upon related topics from previous literature to support their studies, as indicated by the links between each topic cluster. In summary, these 14 topic clusters are the major research information and knowledge of HIB in LIS research field.



Moreover, in the cluster explorer result, CiteSpace reported the top keywords (Latent semantic indexing (LSI), log-likelihood ratio (LLR) p-level, and mutual information (MI)) and the citing articles of each major cluster. However, this study presents only the LSI top terms as shown in Table 3. In addition, we provided a summary of the theme associated with each cluster based on the comprehensive results, which is presented in the final column of Table 3.

**Table 3. HIB in LIS research cluster explorer**

Cluster ID	Top Terms (LSI)	Citing Articles of HIB in LIS research field	Theme of Cluster
0 Covid-19 pandemic	covid-19 pandemic; social capital; healthcare facilities; empirical evidence; social media link	Why did people avoid information during the covid-19 pandemic? understanding information sources' dynamics among pakistani z generation. DOI 10.1108/LHT-02-2022-0113	Covid-19 pandemic and covid-19 vaccination information
1 Cervical cancer	cervical cancer; feminist information engagement framework; gynecological cancer patient; attachment parenting; parenting concept	A feminist information engagement framework for gynecological cancer patients the case of cervical cancer. DOI 10.1108/JD-09-2014-0124	Cervical cancer information behaviour and feminist information engagement
2 Systematic review	systematic review; health information; social media; predicting health information; seeking behaviour	Antecedents predicting health information seeking: a systematic review and meta-analysis. DOI 10.1016/j.ijinfomgt.2020.102115	Concept analysis in health information seeking behaviour and individual health knowledge adoption
3 Health information	health information; professional health communication; discourse structure difference; mediary behavior; exercise behavior change	Discourse structure differences in lay and professional health communication. DOI 10.1108/00220411211277064	Health information communication and theoretical perspective
4 Information horizon	health information; information horizon; health literacy; translocal meaning making; filipino migrant	Towards an everyday life information literacy mind-set: a review of literature. DOI 10.1108/JD-07-2016-0094	Health profession and health information literacy
5 Seeking behaviour	covid-19 pandemic; health information; seeking behaviour; information avoidance; covid-19 health crisis	The causes, impacts and countermeasures of covid-19 "infodemic": a systematic review using narrative synthesis. DOI 10.1016/j.ipm.2021.102713	Covid-19 health crisis and information verification behaviour
6 Open access	open access; health information source; profiling characteristics; medical information user; health information	Profiling characteristics of internet medical information users. DOI 10.1197/jamia.M3150	Health information source and medical information user
7 Colon cancer	colon cancer; national probability sample; cancer news coverage; screening utilization; colorectal cancer	Predictors of perceived risk for colon cancer in a national probability sample in the united states. DOI 10.1080/10810730600637376	Cancer information measuring and screening utilization
8 Disengaged at-risk populations insight	disengaged at-risk populations insight; developing health information literacy; dependent circumstance; information intermediaries; information behavior	Developing health information literacy in disengaged at-risk populations insights to inform interventions. DOI 10.1108/JD-06-2018-0086	Home-care worker and developing health information literacy
10 Health behaviour	health behavior; young men; population-based study; everyday health information literacy; physical fitness	Everyday health information literacy in relation to health behavior and physical fitness: a population-based study among young men. DOI 10.1016/j.lisr.2016.11.013	Social capital and health information literacy
11 Personal cancer knowledge	personal cancer knowledge; planned risk information; seeking model; online information search behaviour; twitter vs facebook	Personal cancer knowledge and information seeking through prism: the planned risk information seeking model. DOI 10.1080/10810730.2013.821556	Understanding family health information and online cancer information search behaviour
12 New Zealander	health information; new zealander; australian; e-mail; communication	Factors associated with e-mail and internet use for health information and communications among australians and new zealanders. DOI 10.1177/0894439309358239	Online health Information and urban community

15 Gather interface	gather interface; supporting distinct health information search task; behavioral pattern; user experience; specific health-related information	Evaluation of a scatter/gather interface for supporting distinct health information search tasks. <i>DOI 10.1002/asi.23011</i>	Supporting distinct health information search tasks and query log
16 Infodemiology approach	infodemiology approach; temporal pattern; health information behaviour; health information avoidance behavior; diabetes mellitus	Rhythmicity of health information behaviour utilizing the infodemiology approach to study temporal patterns and variations. <i>DOI 10.1108/AJIM-01-2019-0029</i>	Context-based interactive health information behaviour and health information avoidance behavior

Therefore, these results can be interpreted that the research topics of HIB in LIS research field are focused on health information from various perspectives, including information-seeking behaviour, information literacy, information searching interface, information communication, health knowledge, and disease information behaviour. Additionally, the concept of information analysis and theory also plays a prominent role in these research topics. When compared to the HIB research alone, many of the research topics exhibit similarities, except the topics on social media, physical activity, psychological issues, smoking cessation, and genetic information. These interdisciplinary topics have garnered significant interest among researchers in the HIB field. Further exploration of these topics within the LIS domain, particularly in areas like health social media and mental health information analysis, would be beneficial.

The cluster analysis supports the thematic tracking of each cluster, enabling researchers to gain a better understanding and stay updated on the progress within the research field.

### Co-occurrence networks

The analysis results provide insights into the relationships between the co-occurrence of words as well as the authors of HIB in LIS research. These show the visual links and measure the impact of each node based on the pairs. In this study, we utilized betweenness centrality as a measure of nodes in a network, which means that the node with high betweenness centrality scores are considered important within the network. As shown in Figure 6, the overview of a co-words network in this research field included the core keywords of health information, internet, care, communication, needs, information, seeking, knowledge, etc. These keywords serve as the key component of HIB in LIS research field. In the author network, we discovered 53 research association communities, however, for better clarity, we filtered the network to provide the best view. The authors who have had a significant impact on this research field were Case, D.O., Nelson, D.E., Palsdottir A., and others as shown in Figure 7. They were cited frequently by other researchers in the same topic area, therefore, they are the core authors in the network.

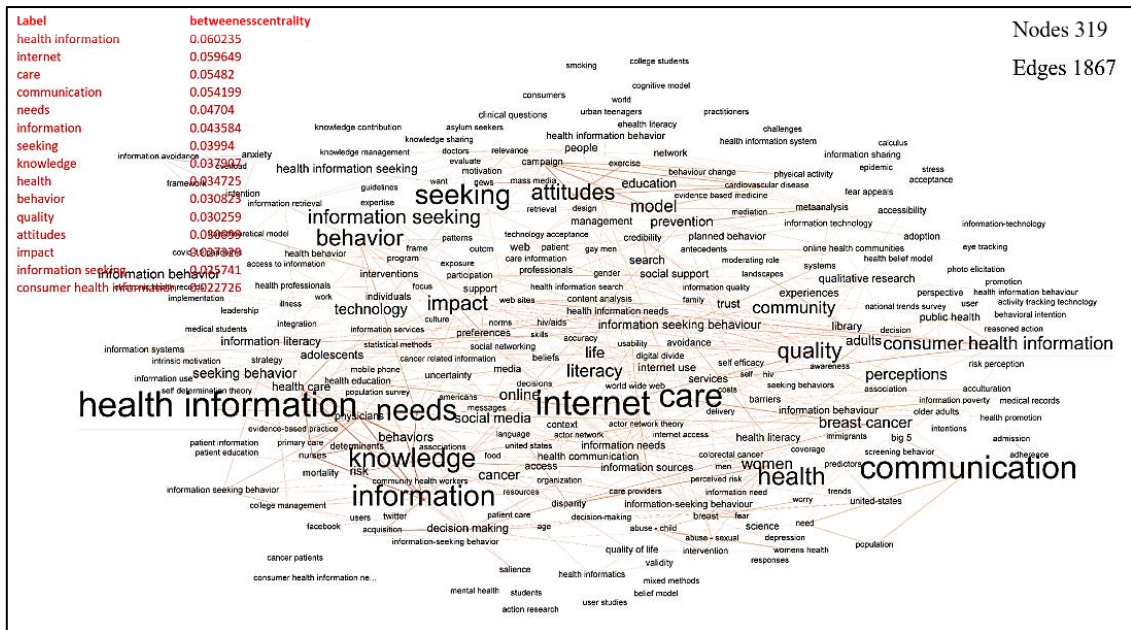


Fig. 6. Keyword co-occurrence network

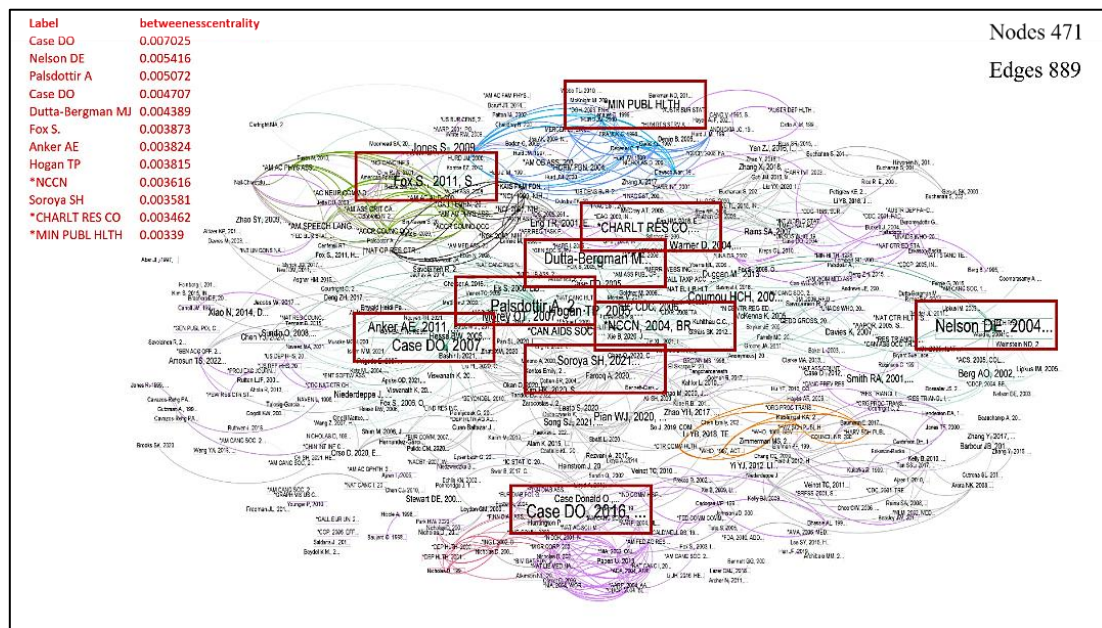


Fig. 7. Author co-occurrence network

## CONCLUSION

This study aims to analyze scientific literature using bibliographic data from WoS. The primary focus was on examining the development trends and research topics of HIB in LIS research field using bibliometrics and network visualization analysis. The results of this study showed that the HIB research in the LIS field has increased since the early 2000s, with a particularly notable increase in recent years. The predominant topics identified were online health information-seeking behavior, the Covid-19 pandemic, and the topic related to information literacy. The co-occurrence of words represents important concepts within the field and forms the key components of HIB in the LIS field. Moreover,

the author network revealed the communities of research associations. Notably, the authors who had a significant impact on the research field were identified based on their high betweenness centrality scores, signifying their influential role in connecting other authors within the network

The results of this study suggest that HIB research in the LIS field is still in its early stages, warranting further investigation to fully comprehend its impact. The comprehensive overview provided by this study contributes to understanding current research trends and topics in the field, while also informing future research directions. Moreover, these findings can guide the advancement of the research field itself. In future extensions of this study, particular attention will be given to exploring the intersection of health information behavior with the Sustainable Development Goals (SDGs).

However, this study has several limitations. Firstly, it relies solely on bibliographic data from the Web of Science (WoS) database, potentially overlooking relevant publications in the field of Health Information Behavior (HIB) within the Library and Information Science (LIS) research field. This limited reliance may result in an incomplete representation of the overall research landscape, possibly excluding important studies from other databases or non-indexed sources. Secondly, while the study's focus on bibliometrics and network visualization analysis offers insights into patterns and relationships among research publications and authors, it may not capture the underlying context, motivations, and intricacies of the research. The qualitative aspects of HIB research may not be fully captured or explored in this study. Furthermore, identifying predominant topics based on word co-occurrence analysis may not fully reflect the depth of research on each topic or the significance of specific studies. Nuances and variations within a given topic may be overlooked. Additionally, while influential authors are identified based on betweenness centrality scores, these scores alone may not capture the quality or significance of an author's work. Further investigation is necessary to comprehensively understand the impact and contributions of influential authors in the field.

To address these limitations, future studies can consider incorporating additional databases, such as Scopus and PubMed, to encompass a more extensive range of relevant publications in the field. To complement the bibliometric and network visualization analysis, future research can adopt a mixed-methods approach that combines quantitative methods with qualitative techniques. This approach may involve conducting a content analysis of selected publications to gain deeper insights into HIB research, ensuring a more comprehensive understanding of the field.

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# **Gamifying Information Literacy: Leveraging Game-Based Learning in Academic Libraries for Enhanced University Education**

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## **ABSTRACT**

This study aims to explore the information literacy skills of university students within academic libraries through the implementation of game-based learning as an instructional method for enhancing information literacy and the ability to discern fake news. In the current digital era, the exponential growth of available information has given rise to the proliferation of fake news and disinformation, leading individuals to unknowingly consume inaccurate and fabricated content. Drawing upon existing research studies, this paper puts forth a proposition for the development of game-based learning as an effective approach to information literacy education among college students. The participants in this research comprised 106 university students who actively engaged in the gameplay and subsequently underwent both pre- and post-tests to assess their level of information literacy knowledge. The findings revealed a significant improvement in information literacy knowledge, particularly in the identification and detection of fake news, among students who completed the game-based learning course.

**Keywords:** Information literacy, Game-based learning, Fake news, University education.

## **INTRODUCTION**

In the contemporary digital era, marked by significant technological advancements, various innovations have emerged. In this era, search engines like Google and social media platforms such as Twitter have become rapid and convenient means of accessing knowledge resources for students. The evolution of technology has facilitated their exposure to and consumption of diverse information sources, which has proven advantageous for their intellectual progress. However, a critical examination of this situation reveals that the sheer magnitude of available content does not consistently guarantee the provision of accurate and reliable data. Consequently, students often find themselves inadvertently exposed to misinformation, disinformation, and even fake news. Misinformation can manifest in various formats, including social media platforms, journalism, and digital media. The present digital era has equipped the younger generation with proficient digital skills, enabling them to access and disseminate knowledge effectively, thus enabling them to navigate the digital realm competently (Drewish et al., 2019). A substantial number of young adults rely on social media to stay informed, share content, and engage with others, which exposes them to a heightened vulnerability towards encountering fake news (Reem, 2022). The prevalence of excessive technology usage among students is evidenced by their engagement in mobile phone activities for extended periods, exceeding 10 to 11 hours daily, while predominantly engaging in passive media consumption. These behaviors have been accompanied by a



decline in their capacity for critical evaluation, critical thinking, and problem-solving (Manfra & Holmes, 2019).

Presently, college-bound students possess the potential to explore creative and enjoyable avenues for acquiring information literacy. They exhibit a willingness to experiment with and succeed in adopting innovative educational approaches, driven by mobile devices, novel learning platforms, and academic incentives aimed at fostering active learning participation within the university setting. Libraries assume a critical role in fostering the development of students' information literacy competencies. The conventional approach known as the "one-shot" technique involves the invitation of a librarian to the classroom, where they elucidate the various resources and services offered by the library. However, a primary challenge lies in students' tendency to overestimate their ability to locate valuable information, coupled with a lack of motivation to cultivate essential information literacy skills (Encheva et al., 2020).

To foster students' engagement in information literacy education and empower them to effectively combat fake news, educational games have emerged as a promising avenue, as evidenced by the endeavors of various researchers and institutions. For instance, in the study conducted by Guo et al. (2017), a cohort of 150 college students participated in an information literacy program implemented through a role-playing game called "Library Escape." Within the game's narrative, players assume the role of an avatar trapped in a library, undertaking six distinct information literacy learning objectives to secure their escape. The investigation revealed that participants exhibited noteworthy levels of interest, enjoyment, emotional satisfaction, and perceived utility throughout their gameplay experience (Guo et al., 2017). Consequently, the aim of the present study is to advance the enhancement of students' information literacy skills within academic libraries by employing game-based learning as a pedagogical approach to imparting information literacy and the ability to discern and detect fake news.

## **LITERATURE REVIEW**

### **Fake News**

The discernment of fake news poses a formidable challenge for social media users, and this predicament has grown increasingly complex with the emergence of modern technologies such as deepfakes (Au et al., 2021). Deepfakes refer to manipulated videos created through artificial intelligence techniques, that convincingly depict individuals engaging in actions or making statements they have not actually done or said (Dobber et al., 2021). In terms of its definition, fake news encompasses fabricated and highly misleading information disseminated on websites that ostensibly appear to be reliable sources of mainstream news (Pennycook & Rand, 2021). Additionally, fake news comprises content circulated by news-oriented platforms, whether intentionally or inadvertently, that contains misinformation capable of distorting genuine facts in a manner that misleads news consumers and perpetuates inaccuracies (Hinsley & Holton, 2021). The characteristics of fabricated information exert a profound influence on individuals' perceptions and may lead them astray when they engage in contemplating or interpreting news headlines. One notable characteristic is familiarity, which plays a pivotal role in fostering intuitive trust in news. The psychological phenomenon known as the illusory truth effect illustrates the impact of past experiences on truth judgments. Even a single encounter with a counterfeit news headline enhances subsequent belief in its validity (Smelter & Calvillo, 2020). Consequently, sensations of familiarity and cognitive processing abilities independently contribute to an elevation in the acceptance of false assertions.

Another crucial factor to consider when evaluating news is the source of the information. Individuals tend to place their trust in content delivered by sources they deem reliable, and extensive research in political science has convincingly demonstrated the influence of elite content on the broader

public's perspectives (Zaller, 1992). Numerous social media platforms, characterized by their feedback mechanisms, inadvertently foster the proliferation of news content, including misinformation (Avram et al., 2020). Moreover, emotionally charged headlines represent a discerning feature of fabricated news articles. Such deceptive content often aims to elicit shock, moral outrage, terror, or resentment among its readership (Crockett, 2017). Remarkably, news consumers who experience a broad range of emotional responses upon encountering headlines, whether positive or negative, are more inclined to place trust in deceptive news. In fact, the manipulation of individuals' reliance on emotional cues contributes to a heightened belief in misleading headlines (Martel et al., 2020).

### **Information Literacy**

The exponential expansion of information resources has led to the emergence of new entities like the information society, characterized by real-time connectivity through satellite transmissions and dedicated submarine cables. Educational institutions, from schools to colleges, now have access to an infinite wealth of up-to-date information through internet resources. Presently, the internet serves as the primary source of academic information for students (Arman et al., 2020). Notably, studies have revealed that digital natives, individuals born into the digital era, do not necessarily possess inherent proficiency in effective internet search techniques (Çoklar et al., 2017). Consequently, students often encounter challenges when analyzing and synthesizing online content from diverse sources, particularly in assessing factors such as reliability, validity, impact, currency, bias, and perspective (Parsazadeh et al., 2015). Therefore, higher educational institutions have a responsibility to offer information literacy education, equipping learners with the necessary skills to efficiently locate pertinent data, critically evaluate its content and significance, and acquire new knowledge (Kavšek et al., 2016).

Information literacy encompasses a comprehensive set of skills that enable individuals to engage in analytical discovery, understand the processes of content creation and evaluation, utilize data to generate new knowledge, and participate responsibly within learning communities (Association of College and Research Libraries, 2015). It comprises four distinct dimensions: awareness of information, acquisition of knowledge, discrimination of information, and application of information. The Internet, renowned for its vast wealth of knowledge, has become an indispensable resource for graduate students. Consequently, the ability to effectively select, evaluate, and manage information becomes a critical prerequisite for their meaningful engagement in educational endeavors. Moreover, information literacy, with its roots in the concept of bibliographic education, has always maintained a strong connection with the field of librarianship. Bibliographic education, aimed at facilitating access to and retrieval of materials, laid the foundation for the development of information literacy (De Paor & Heravi, 2020).

Within the field of library science, a multitude of information literacy models and frameworks have emerged, centered around a set of competencies designed to guide and instruct information users. Many of these models aim to equip higher education learners with the necessary skills to locate, evaluate, and ethically utilize information. For instance, the CILIP information literacy framework encompasses eight key skills that individuals well-versed in information literacy should possess: (1) understanding information needs, (2) identifying available resources, (3) conducting effective information searches, (4) critically evaluating search results, (5) appropriately applying acquired information, (6) considering ethical and responsible information use, (7) engaging in information sharing and communication, and (8) effectively managing findings (CILIP, 2018).

### **Game-Based Learning**

In recent years, game-based learning has garnered increasing scholarly attention, with researchers delving into its potential benefits and applications (Zou, 2020). Particularly in higher education, the advantages of game-based learning in terms of learner motivation, self-regulation, learning

performance, and perspectives have been extensively studied and found to be advantageous (Troussas et al., 2020). Furthermore, educational games, by creating an engaging learning environment, can instill a sense of enjoyment in studying, enabling learners to navigate through various challenges with confidence, perseverance, and a focused mindset (Romero et al., 2017). Given these benefits, educational institutions such as colleges and universities play a crucial role in fostering a lifelong learning approach by incorporating game-based learning methodologies (Liu et al., 2020). Despite the generally recognized benefits of digital game-based learning, it is important to acknowledge that not all learning experiences are equally fruitful. Poor development and design can result in unappealing, uninteresting, and minimally educational experiences (DiNardo & Broussard, 2019).

Previous research has identified five crucial components for effective educational games: First, the inclusion of fantasy elements, wherein games create immersive imaginary worlds with captivating plots, engaging scenarios, and captivating environments (Jemmali et al., 2018). Second, the aspect of identity, whereby players assume the roles of central protagonists within the game's narrative (Annetta, 2010). Third, interactivity, which allows participants to interact not only with other players but also with computer-generated non-player characters (NPCs) (Perttula et al., 2017). Fourth, the integration of rewards, wherein players receive points or prizes for completing tasks or demonstrating exemplary performance within the game (Park et al., 2019). Finally, the promotion of knowledge enhancement, with games designed to facilitate participants' acquisition of the necessary knowledge and skills to achieve the desired learning outcomes (Annetta, 2010). These components serve as critical considerations for the effective implementation of game-based learning in educational contexts.

Furthermore, the incorporation of competition in game-based learning motivates students to surpass their peers and attain success, as evidenced by studies conducted by Chen et al. (2018). This competitive element is believed to enhance learning outcomes, student engagement, motivation, and overall consistency in academic endeavors (Chen et al., 2020). In the context of teaching information literacy through game-based learning, Cagiltay et al. (2015) introduced a competitive framework that enables students to monitor their own progress as well as the performance and rankings of their fellow students through a leaderboard system. This framework provides a means for students to actively engage in the learning process while fostering a sense of healthy competition and achievement within the educational setting.

## **PURPOSE OF THE STUDY**

The aim of this study is to enhance the information literacy skills of college students within academic libraries by implementing game-based learning approaches that focus on information literacy education and the detection of fake news. It is crucial for learners to develop media and information literacy, enabling them to understand, evaluate, analyze, and effectively utilize knowledge to address issues and respond to inquiries related to false content. By incorporating a game-based approach, the learning process becomes engaging and motivating, ensuring that students enjoy acquiring information literacy skills while actively participating in the educational experience.

## **INSTRUMENTS**

### **Game Design**

The present study adopts the MDA (Mechanics, Dynamics, Aesthetics) framework, as proposed by Alevén et al. (2010) and Intawong & Puritat (2021), as a guiding principle for the design process of the game. The MDA framework encompasses three fundamental aspects: mechanics (M), dynamics (D), and aesthetics (A). A key focus of the game design is to captivate players' attention and engender

replayability (Adellin et al., 2019). The research paper suggests incorporating multiple alternative storylines influenced by players' choices to enhance the game's replayability. Furthermore, the game design in this study aligns with the knowledge expert co-creation brainstorming framework (Ariya et al., 2019), which facilitates collaboration with information literacy experts. The aim is to strike a balance between the educational objectives of the game and its entertainment value. To determine the educational targets, the study employs the CRAAP test (Aufderheide, 1993) to evaluate the fake news commonly encountered in college information literacy courses. The goal of the methodology is to engage college students, who possess a foundational level of information literacy, in a game with intricate mechanics.

### **Game Core Flow and Mechanics**

The primary objective of the game is to simulate the role of a librarian in the National Library of Thailand, where players assume responsibility for evaluating news articles sourced from various platforms, including social media and newspapers. Their task is to critically assess the accuracy of the news and disseminate their findings to the public. Through this immersive experience, players gain insight into the detrimental impact of disinformation on both the community and the town. The core process and mechanics of the game entail the fundamental activities that guide gameplay and player interactions. The core process comprises four distinct stages: (1) The initial stage involves the player taking a virtual walk from home to work, providing a simulation of how fake news affects the daily lives of town residents (as depicted in Figure 1). (2) The second stage involves engaging with individuals in the community and initiating discussions with residents from different areas to understand their perspectives on the news. (3) The third stage revolves around exploring the neighborhood and town, allowing players to observe the adverse consequences of fake news within the community. (4) Finally, the fourth stage entails heading to the workplace and evaluating the credibility of news sources before sharing them with the public. This evaluation is conducted using the CRAAP test, which assesses the currency, relevance, authority, accuracy, and purpose of the news source (as shown in Figure 2). If the players determine that the news source is untrustworthy or dubious, the game system will label it as "fake news" during the evaluation task. The players are encouraged to continue playing the game until they are able to identify a news source as reliable and trustworthy. Conversely, if the news source is deemed reliable and the information accurate, the system will label it as "real news," as depicted in Figure 3.

The game-based learning intervention was created utilizing the Unity game engine, a widely recognized software platform (<https://unity.com/>). Two distinct versions of the game were developed to cater to different user preferences and accessibility requirements, namely the PC desktop version and the web-based version accessible via the link (<http://lis.human.cmu.ac.th/fakenews>). In addition to the game itself, a server infrastructure was implemented to facilitate data collection and player behavior monitoring. The server was developed using PHP 7.0 and MySQL, industry-standard technologies for handling web-based applications and managing relational databases, respectively.



Fig. 1. A player walking and talking to people in a community (2023)

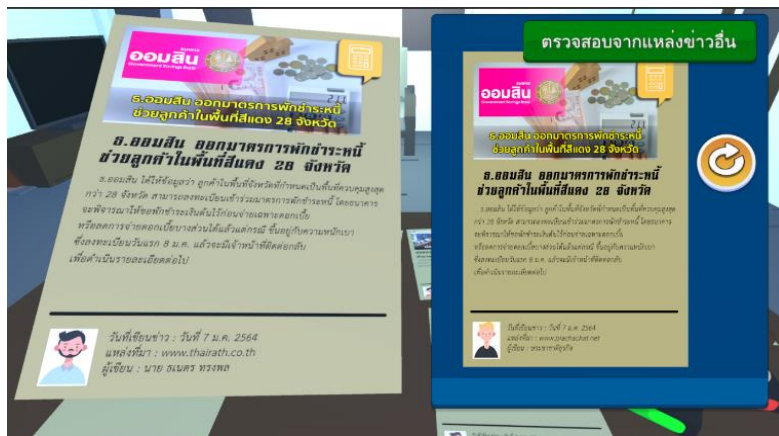


Fig. 2. A player judging the source of the news before sharing (2023)



Fig. 3. The source of news evaluated as real news (2023)

## **METHODOLOGY**

### **Participants**

The participants of this study consisted of 106 college students who voluntarily expressed their interest in participating in the gameplay. They were recruited through official university channels and the Organization of Safe and Creative Media Development Fund. Prior to engaging in the game, participants were informed about the research project and invited to provide their consent for a voluntary in-game survey. This survey was conducted over a period of two months and was strictly associated with the research project. It is important to note that the information collected from the players will be utilized exclusively for research purposes. Only the data from participants who completed the game and explicitly consented to sharing their information will be included in the research results. Confidentiality and privacy measures have been implemented to ensure the anonymity and protection of participants' personal data.

### **Procedure and Measurement**

Upon completion of the gaming experience, participants were instructed to undertake both pre- and post-tests within the game module. These tests were specifically designed to assess the participants' information literacy skills, with a particular focus on their ability to critically evaluate news sourced from social media. The study identified this capacity as a crucial dependent variable. The news content in the game module encompassed five distinct news groups: education news, economy news, crime news, health news, and belief and religion news. Within each news group, participants encountered ten news articles throughout the game. Their task was to discern the authenticity of each news article, distinguishing between fabricated and accurate information. To ensure variability, the game module presented six news articles daily, randomly selected from the aforementioned news groups.

The evaluation of news sources is conducted through the implementation of the CRAAP test, a widely recognized framework that assesses key dimensions including currency, relevance, authority, accuracy, and purpose. By employing this test, individuals can critically analyze the quality and reliability of news content, taking into consideration factors such as the timeliness, pertinence, credibility, factual correctness, and underlying motives of the news source. The CRAAP test prompts individuals to pose pertinent questions such as: When was the news article originally published or posted? Have multiple sources been consulted and cross-referenced before deeming this particular source reliable? What insights can be gleaned from the URL regarding the author or source? Are proper citations provided to verify the origin of the news? Does the information presented reflect factual evidence, personal opinion, or potential propaganda? By addressing these inquiries, individuals can develop a comprehensive understanding of the news source's reliability and integrity.

After successfully completing the game, participants were required to undertake the post-test within the game module. It is worth noting that the content of the game, including the news articles, was meticulously curated based on genuine online news sources, with the selection process overseen by a professor from the Department of Library and Information Science. Detailed information regarding the news type and corresponding descriptions in the gameplay can be found in Table 1.

**Table 1. Types of News and Its Description**

<b>Type of news</b>	<b>Description</b>
Education news	Important news that provides education access to all students.
Economy news	News concerning finance, economy, and economics.
Crime news	News about crimes that occur in a society and represent social problems.
Health news	Health-related news affecting people all around the world.
Belief and religion news	News about religious movements, ethics, spirituality, and moral.

## **RESULT AND DISCUSSION**

Upon completion of the news evaluation task, data were collected from the 106 college students who participated in the study. The collected data was then analyzed to assess the impact of game-based learning on the participants' news evaluation skills. The experimental results, as depicted in Table 2, present the findings of the pre-test and post-test evaluations conducted with the participants. To conduct the statistical analysis, the researchers utilized the SPSS program and employed a paired sample t-test to assess the efficacy of game-based learning in enhancing information literacy skills among university students. As outlined in Table 3, the pre-test mean score was 12.25 (SD = 1.74), while the post-test mean score was 19.70 (SD = 1.59). The difference between the two means was found to be statistically significant, with a p-value of 0.001. The significance of this p-value indicates a substantial difference and provides compelling statistical evidence supporting the notion that game-based learning has the potential to enhance information literacy knowledge, particularly in the context of identifying fake news.

The findings of this study align with previous research examining the effectiveness of game-based interventions in addressing the issue of online disinformation. For instance, the outcomes are consistent with the findings of Roozenbeek's (2019) study on the Bad News game, which demonstrated a significant reduction in the perceived trustworthiness of online news sources associated with disinformation. Similarly, Katsaounidou's (2019) research, which focused on the development of the MathE game, revealed that participants exhibited a heightened critical mindset when evaluating online information and news. Many participants reported an increased awareness of the issue of fake news and expressed a desire to exercise greater caution when consuming information in the future.

**Table 2. The pre-test and post-test of university students on news evaluation skills**

Group	N	Pre-test (SD)	Post-test (SD)
Participants	106	12.25 (1.74)	19.70 (1.59)

**Table 3. The result of verification of t-test assumptions for the pre-test and post-test**

	Mean	Std. Deviation	T-value	P-value
Pre-Post (Immediately)	-7.45283	2.39	-32.146	0.001

## CONCLUSION

The present study proposes the implementation of game-based learning as an instructional method for enhancing information literacy and promoting the ability to identify fake news among college students in academic library settings. The research involved a sample of 106 university students who were required to undergo an information literacy pre-test prior to engaging in the gameplay. Completion of all stages of the game was obligatory for all participants. Subsequently, an information literacy post-test was administered to assess the students' learning outcomes following their participation in the game. The study findings demonstrated a statistically significant difference in information literacy knowledge, specifically in relation to the evaluation of news sources on social media, among those who underwent the game-based learning intervention. In summary, this investigation highlights the advantages of employing game-based learning as an effective approach to enhancing college students' information literacy skills, particularly in the context of detecting and identifying fake news.

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# Enhancing Critical Thinking Skills of Thai Elementary School Students through Learning Resources and Media Literacy

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## ABSTRACT

This research aims to investigate the usage of learning resources in schools for the development of critical thinking skills through media literacy among elementary school students and to examine approaches for enhancing the potential of learning resources in schools to develop students' critical thinking skills through media literacy. The study employs a mixed-method approach, collecting both quantitative and qualitative data. The sample consists of school administrators, teachers, librarians, or teacher librarians under the jurisdiction of Chiang Mai Primary Educational Area Office 6.

The research findings indicated that the usage of learning resources to develop students' critical thinking skills is at a high level ( $\bar{x} = 3.67$ , S.D. = 1.14). In particular, the students have been encouraged to participate in activities that promote the development of cognitive skills, especially through the use of technological learning resources such as internet-based activities, online lessons, and social media ( $\bar{x} = 3.70$ , S.D. = 1.21). The enhancement of the potential of learning resources to develop students' critical thinking skills through media literacy is based on four approaches: physical environment, learning resources, services, and activities, and learning promotion within the community.

**Keywords:** Critical thinking, Elementary school students, Learning resources, Media literacy

## INTRODUCTION

Since the Thai government has planned to develop Thai citizens into digital citizens as part of their strategy to adapt to the changes of the 21<sup>st</sup> century and to create a significant workforce for the country's development. With the aim for accomplishment, the government has reinforced on transforming the learning process in line with the concept of Education 4.0. with the main objective to cultivate creative thinking among Thai people, foster innovation, enhance work productivity, and instil a sense of public-mindedness that prioritizes collective benefits over personal interests (Research and Quality Assurance Division, 2017). The transformation of the learning process aimed to prioritize the enhancement of critical thinking skills, information literacy, digital skills, ICT literacy, and media literacy. Through these actions, it seeks to uplift the capabilities of the Thai citizens (Research and Quality Assurance Division, 2017). The development of critical thinking skills of students has been defined as an indicator on basis of education standards in Standard 4, which means that students need to be able to think, practice, and create—with a transformation in teaching and learning methods using student-centred approaches and lifelong learning skills in order to equip students with skills for analytical thinking,

synthesis, creative thinking, and critical thinking (Office of the Basic Education Commission, 2007). Nevertheless, the majority of the teachers still rely on lecture-style teaching and seem to lack of activities that encourage students to seek knowledge from other sources rather than classroom, such as libraries and community learning centres (Phayung, Panom, & Kranplu, 2015). Moreover, in order to develop students' skills, the learning environment must be prepared to meet the demands of the 21st century global society. Resulted in critical thinking is a crucial skill for promoting and enhancing students' learning abilities, leading to lifelong learning (Ranaweera, 2008) and preparing them for their future lives. Therefore, the ability to think analytically is necessary for students as it enables logical thinking, broad perspectives, informed decision-making, and the ability to effectively adapt to a constantly changing society (Surangkan, 2010).

Furthermore, in the digital era, students need to possess media literacy skills. These skills involve critical thinking processes that enable them to access media, analyze media content, apply media, and create appropriate media without negative consequences or impacts on their own lives, families, and society. In the 21<sup>st</sup> century, media literacy is crucial for developing and empowering children and youth to effectively analyze and evaluate media, especially online media. In this case, the media literacy would help to create a strong defence mechanism for children and youth, and analysis and evaluation of media require intellectual thinking processes, such as critical thinking, analytical thinking, or logical thinking. These processes enable analysis of media by asking questions, which helps youth acquire knowledge, understanding, and skills to receive, select, analyze, evaluate, and comprehend impact of media on behaviors, desired outcomes, and appropriate management of such situation. These also includes ability to use media for beneficial purposes and respond with reasonable opinions as well as the critical thinking, which can be developed through various learning and training techniques and activities; therefore, developing media literacy skills promotes cognitive development and critical thinking skills.

In the contemporary contexts, the number of research projects in Thailand focus on studying critical thinking skills of learners at various levels of education to improve critical thinking skills through different teaching approaches, such as problem-based learning, project-based learning, cooperative learning, five steps learning management, inquiry-based teaching and 7E teaching. However, research on development of critical thinking skills through media literacy in Chiang Mai has not been prominently observed. Learners in Chiang Mai Primary Educational Area Office have the educational performance and results of standardized national exams significantly lower; they have lower scores in reading, mathematics, and science compared to the national average (Institute for the Promotion of Teaching Science and Technology, Ministry of Education, 2021). Therefore, they require urgently develop students' abilities to think in order to enhance reading abilities and intelligence in math and science of in the digital age.

Therefore, objectives of this research is to investigate current situation as well as learning environment both inside and outside classrooms, which promote learning and activities to enhance learners' critical thinking skills. The research aims to develop appropriate approaches to develop critical thinking skills through media literacy for students. In addition, this research aims to raise awareness about importance of critical thinking skills and value of learning resources both inside and outside classrooms, which must meet learning needs of students, enabling them to seek knowledge in various formats more easily. Consequently, the quality of learning and the quality of students will lead to lifelong learning and contribute to development according to Thailand policies.

## **LITERATURE REVIEWS**

This research has encompassed the following topics: critical thinking skills, media literacy skills, the development of critical thinking skills, the development of media literacy skills, learning resources in

schools, the role of teachers, learning management, and organizing activities for the development of critical thinking skills.

Learning resources in schools refer to sources of knowledge, information, news, and experiences within the school environment that support and encourage students to seek knowledge and engage in self-directed learning according to their interests, in a broad and continuous manner and become lifelong learners.

Critical thinking skills refer to abilities to critically thinking to evaluate information, events, and various phenomena by carefully analysing data and evidence, different arguments, and making logical and reasonable decisions. Reasoning and logical thinking skills lead to appropriate decisions in different situations as well as reasonable conclusions.

Media literacy refers to skills and knowledge, ability to access, select, understand, interpret, analyse, and evaluate information from various media sources as well as understand boundaries and dissemination of media information. Moreover, it involves understanding influence of media and being aware of impact of media on individuals and society. Moreover, media literacy enables individuals to use and create media appropriately and ethically.

Obviously, teachers play a crucial role in developing students' media literacy skills by recognizing their students' media literacy skills and using inquiry-based learning approaches. Teachers might need to have knowledge and understanding of effective learning process and be able to engage students by encouraging them to seek answers and explore knowledge. The teachers can demonstrate a role of engagement, exploration, thinking, analysis, explanation, and application of acquired knowledge as well as an evaluation of students' media analysis should be conducted to ensure further skill improvement ultimately.

By developing critical thinking skills through media literacy, teachers must effectively manage teaching and learning by planning and organizing activities that engage students. This includes providing appropriate questions based on students' age and capabilities, as well as continuously motivating and reinforcing their involvement.

The solely learning within classrooms may not be sufficient for developing students into digital citizen who can adapt to changes of the 21<sup>st</sup> century and become lifelong learners. The most accessible learning resource outside the classroom is a school library, which plays a crucial role in developing for various skills, such as reading and writing skills, information literacy skills, and media literacy skills. These skills lead to the development of critical thinking skills and lifelong learning (Ranaweera, 2008). These learning resources significantly affect quality of teaching management, activities, and teaching behaviors of teachers in developing students critical thinking skills and media literacy. To create an environment, which is captivating and interesting, such as atmosphere in the library that sparks curiosity and provides sufficient, up-to-date, and quality information resources, meet student needs as well as supports both individual and collaborative research. Furthermore, factors that promote student's potential in various skills within the library include quality and diversity of information resources, library activities, library instruction organized by professional librarians and library staff with knowledge and expertis, and supporting and encouragement from school administrators.

## **RESEARCH OBJECTIVES**

1. To investigate usage of learning resources in schools for developing critical thinking skills through media literacy of elementary school students.
2. To examine approaches for enhancing potential of learning resources in schools to develop students' critical thinking skills through media literacy.

## RESEARCH METHODOLOGY

This research had employed a mixed methods approach, combining both quantitative data and qualitative data with the aim to develop critical thinking skills through media literacy for students in the schools affiliated with Chiang Mai Primary Educational Service Area Office.

### Quantitative research approach

The population consisted of school administrators, teachers, librarians, or teachers responsible for the library of schools in six educational areas under the jurisdiction of Chiang Mai Primary Educational Service Area Office; 656 schools in total. A stratified random sampling method was employed with the 330 samplings, which postulated formula by Krecie and Morgan (1970), with a confidence level of 99% and a margin of error of +/- 5%. Questionnaires were employed to explore current situation, issues, and utilization of learning resources within schools to enhance students' critical thinking skills. A questionnaire consisted of three parts as follows;

*Part 1:* General information including gender, age, educational qualifications, work experience, and current school experience,

*Part 2:* Condition, issues, and utilization of learning resources within schools to promote students' critical thinking skills,

*Part 3:* Open ended questions. The researchers verified the content validity of the questionnaire with three experts. The Index of Item Objective Congruence (IOC) yielded a value of 0.94. After collecting data, a descriptive analysis, statistical techniques, such as frequency distribution, percentages, mean, and standard deviation were used to analyzed collected data.

### Qualitative research approach

The qualitative research approach involved focused group discussions, the sampling comprised of 30 school administrators and teachers. The discussion consisted of themes: conditions, problems, and suggestions about learning resources in schools to promote learning and critical thinking. As for the qualitative data obtained from group discussions, content analysis was employed to categorize and interpret into themes and categories.

## RESEARCH FINDINGS

The majority of questionnaire respondents were female (58.18%), aged between 31-35 years old (22.42%), hold a Master's degree (53.64%), graduated in education management (10%), teaching experiences for 6-10 years (30.91%), teaching in current schools for 1-5 years (63.33%), and working in medium-sized schools (121-719 students) (67.85%).

In terms of learning resources, the majority of the schools equipped with internet networks (99.09%), libraries (94.84%) and computer laboratories (93.03%). More than a half of schools provided Distance Learning via Satellite TV (DLTV) (55.45%). 49.39% of school provide self-sufficient economy learning centers. 41.51% of schools provide subject-based learning resource centers. 14.24% of schools have Intellectual Centers. Less than 10.00% of schools provide Educational games, Google Meet virtual classrooms, Art rooms, Makerspaces, Music rooms, and Vocational skills training rooms.

The usage of learning resources to develop students' critical thinking skills was at a high level ( $\bar{x}$  = 3.67, S.D. = 1.14). With the highest mean score ( $\bar{x}$  = 3.70, S.D. = 1.21), students have been encouraged through activities that enhance their thinking processes, particularly in keeping up with media-related knowledge from online learning resources, such as online activities, online lessons, and online social media. Follow by, students have also been encouraged through activities that develop thinking skills from external learning resources outside schools, such as field trips, offsite learning, and

knowledge exchange with individuals in the community ( $\bar{x} = 3.68$ , S.D. = 1.15). Furthermore, students typically access and utilize learning resources within the school to develop knowledge related to media literacy, such as the library, computer laboratories, and various learning centers ( $\bar{x} = 3.66$ , S.D. = 1.15). They have also been encouraged in activities that enhance thinking processes regarding media knowledge from learning resources within the school, such as clubs, societies, camps, and so on ( $\bar{x} = 3.63$ , S.D. = 1.06).

Overall, teachers have used learning resources to develop students' critical thinking skills at a moderate level ( $\bar{x} = 3.49$ , S.D. = 1.23). Teachers had mainly used computer laboratories and various learning centers to facilitate students' research on the Internet in order to develop critical thinking skills ( $\bar{x} = 3.65$ , S.D. = 1.19). Next, teachers connect learning to the community, nature, and environment using critical thinking processes ( $\bar{x} = 3.63$ , S.D. = 1.14). Furthermore, teachers have used the library as a learning resource for students to read or search for information to develop their critical thinking skills ( $\bar{x} = 3.38$ , S.D. = 1.22) and led students to use computer technology to search for information on the Internet to improve critical thinking skills ( $\bar{x} = 3.10$ , S.D. = 1.36).

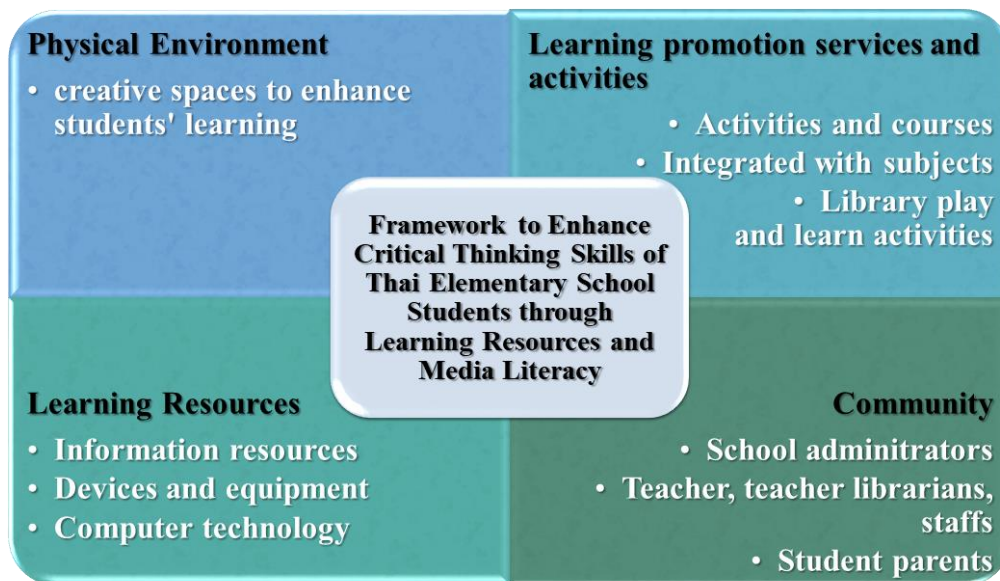
Turning into the content analysis, the open ended questions in a questionnaire has categorized into 7 main issues: 1) Management: *insufficient budget/shortage of budget*; 2) Overall condition of learning resources: *lack of readiness and insufficiency*; 3) Conditions of each type of learning resources: *insufficient computer laboratory and equipment, libraries are small, cramped, not up to date, or temporarily closed*; 4) Equipment condition: *damaged and outdated*; 5) Condition of learning materials: *not enough books in the library*; 6) personnel: *shortage of IT staff teachers, lack technology skills*; and 7) Utilities: *unstable internet network*.

Meanwhile, the content analysis of focused group with school administrators and teachers on development of critical thinking skills through media literacy has categorized into 6 main issues: 1) Resources: *lack of media and equipment*; 2) Management: *budgeting problems, administrators vision problems, policy problems, and monitoring problems*; 3) Collaboration/network: *lack of collaboration with the government sector*; 4) Physical environment of the school: *located in the backcountry, no the Internet and electricity*; 5) Personnel: *lack of personnel, collaboration of personnel, and lack of skills*; and 6) Students: *large number of students, students' lack of knowledge and skills, and students are ethnic groups with language differences*.

Additionally, the suggestions from the usage of learning resources to develop students' critical thinking through media literacy has categorized into 5 main issues: 1) Network: *collaborate with government and private agencies*; 2) Management: *provide budget, right problem solving, set clear policy on curriculum and activities, supervise skill development*; 3) Personnel: *personnel development, seek assistance from experts*; 4) Resources: *allocate media and equipment*; 5) Students: *develop skills and raise awareness in order to overcome challenges in teaching and learning to develop critical thinking skills through media literacy, declining reading skills during school closures due to the COVID-19 pandemic, and students' lacking communication skills and hesitating to express their thoughts, such as answering questions during class for students*.

Thus, the researcher has employed the results of literature analysis, the findings of the investigation of current situation and the findings of the focus group to develop a framework for enhancing the potential of school-based learning resources to foster elementary school students' critical thinking skills. Considerably, schools should be a learning community with diverse sources of information, news, knowledge, science, and a wide range of experiences to enhance the learning environment in schools, focusing on the importance of students and promoting their learning skills, curiosity, and self-directed learning. Learning resources in schools would play a crucial role in developing students' critical thinking skills in the following four approaches:





**Fig. 1. Framework to Enhance Critical Thinking Skills of Thai Elementary School Students through Learning Resources and Media Literacy**

## 1. Physical Environment

Schools should provide creative spaces to enhance students' learning by considering provide spaces for services as well as activities, equipment, and various tools. This promotes effective teaching and learning and various benefits for students, including improving reading skills, fostering a reading culture, and enabling deep and continuous learning based on individual interests and self-directed learning. Examples include:

1.1. School libraries can be creative spaces with flexibility to accommodate collaborative learning, emphasizing hands-on learning, experimentation, individual and group-based research, and invention.

1.2. Laboratories, such as computer labs, science labs, and language labs, for students to engage in hands-on activities.

1.3. Classrooms, to supporting subject-specific learning, can have mobile libraries or book corners to encourage further exploration within the classroom.

1.4. Other open spaces within the school, such as:

1.4.1. Botanical gardens, medicinal gardens, or health gardens to learn about plant species and promote related professions.

1.4.2. Museums, such as community intellectual museums

1.4.3. Multimedia rooms, audiovisual rooms, to support e-learning

1.4.4. Internet rooms for online access to educational resources

1.4.5. Ethics rooms, art rooms, to promote aesthetic appreciation and instill moral values.

The additional learning resources for developing critical thinking skills through media literacy can be an agricultural garden, using hydroponic techniques and organizes activities to develop vocational skills, and botanical garden.

## 2. Learning Resources

The schools should provide learning resources in various platforms and provide equal opportunities for all learners to access learning resources, especially the library, which is a suitable resource for

promoting individual and collaborative learning. The learning resources include books, magazines, journals, board games, as well as various materials and equipment such as computer technology, information and communication technology in other types of learning environments. These resources serve as tools for developing learners' skills based on their abilities and interests. In addition, both the library and other learning environments should incorporate new platform of learning resources into the curriculum to facilitate hands-on learning with instructional media, materials, and various equipment. This approach extends learning beyond theoretical understanding and allows learners to perceive, know, and understand the authentic situation.

These activities in the classroom comprised various techniques such as PLC, PDCA, STEM, STEAM, active learning, and flipped classroom were as follows;

1. Conducting in-class activities to develop students' critical thinking skills through media literacy in computer science subjects. Teachers utilize flipped classroom teaching methods to enhance student learning,

2. Implementing teaching and learning activities aligned with the curriculum standards in technology subjects for students of all grade levels and use ICT media in classrooms and learning resources in a computer laboratory,

3. Integrating learning within classrooms and computer science subjects to provide additional knowledge,

4. Organizing training activities to enhance understanding of critical thinking and media literacy during home room or computer class hours,

5. Incorporating learning and teaching activities in computer science and other subjects to enhance critical thinking skills through media literacy and organizing science camp to foster critical thinking skills through media literacy,

6. Engaging in activities, such as YouTuber projects by using media literacy as topics in teaching and learning in order to raise students' awareness and think critically.

### **3. Learning promotion services and activities**

In addition to providing physical environments and learning resources, learning environments should offer services and activities that promote learning were as follows:

- 3.1 Activities and courses, such as a courses that develop critical thinking skills through a process of knowledge-based learning, enabling learners to access media, analyze and critically evaluate content, use media responsibly and ethically, and create appropriate media themselves.

- 3.2 Library activities that promote learning through self-study, exploration, teamwork, leading to the development of creative thinking, invention, and innovation. Examples include activities that promote reading, online gaming competitions, and board game competitions.

- 3.3 Integrated learning activities across different subject areas through more collaboration between librarians and subject teachers, such as science project competitions, innovation development competitions, herb planting activities, and organic fertilizer activities

Additionally, Teaching and learning activities can integrate with technology were as follows:

- a) Conducting computer-related activities during class hours

- b) Implementing teaching and learning methods that emphasize critical thinking skills in all subjects and allocating dedicated hours for skill development, students can practice critical thinking through various media, such as reading news articles or watching videos, and encouraging them to analyze and apply their thoughts to their learning

- c) Enhancing teaching and learning activities in the field of technology and consistently promote media literacy among staff and students

d) Promoting digital literacy learning in computer science subjects to enhance students' digital skills

e) Designing teaching and learning approaches, which integrate critical thinking skills through media literacy across all activities and learning experiences. The teacher may embed content or specified as a characteristic of learning management plan and took students out of the classroom to use other suitable learning resources based on the nature of the subject as well as emphasized students' participation in learning design process.

#### **4. Community**

The school administrators, teachers, librarians, staff, students, parents, government agencies, and private organizations play a crucial role in developing students' critical thinking skills by working as a network and planning and implementing activities together. The effective management entails the development of students' critical thinking skills, particularly in objectives for organizing activities, determining platform of activities, allocating and managing resources, budgeting, developing capacity of personnel, as well as studying additional information from manuals, relevant documents, and case studies from schools with similar contexts. This would be necessary to rely on collaboration and willingness of stakeholders to ensure efficiency and potential of learning environment, enabling changes and improvements that support and enhance students' hands-on learning and critical thinking skills.

The schools should establish policies to develop critical thinking skills were as follows:

- 1) Teachers encouragement to enhance their technical skills and instructional methods to develop students' critical thinking skills,
- 2) Implementing active learning as a teaching approach focusing on hands-on practical learning rather than classroom-based learning,
- 3) Integrating various teaching methodologies by applying different instructional theories,
- 4) Incorporating critical thinking skills into each subject's learning management,
- 5) Integration of various teaching approaches such as STEM Education, Active Learning, Thai-English language skills enhancement camps, and Task-based learning.

#### **CONCLUSION AND DISCUSSION**

The investigation on the current situation of developing critical thinking skills through media literacy among primary school students revealed several important factors, including school management, teachers, learning resources, and learning environments, the details were as follows:

1. The school management had played a significant role in developing students' critical thinking skills since the school promoted and supported teachers' professional development to apply technology and innovation to enhance critical thinking skills through media literacy. Schools have encouraged teachers to enhance their technical skills and instructional methods to develop students' critical thinking skills through media literacy, for example, meetings, training, workshops, and field trips. Additionally, the schools have facilitated consultation and knowledge sharing among teachers in various subject areas regarding development of students' critical thinking skills through media literacy.

2. The learning management by teachers to develop students' critical thinking skills through media literacy at an intermediate level, this includes curriculum and instructional development, as well as learning management approaches to enhance students' critical thinking skills through media literacy.

3. Nevertheless, although the majority of the schools have equipped internet networks, libraries, and computer laboratories, the learning resources and learning environments has stilled inadequate since the usage of learning resources to develop students was at a low level; consequently, schools cannot effectively promote learning and developing critical thinking skills through media literacy.

Therefore, to develop learning resources through design and implementation of learning environments in schools aims to promote development of students' critical thinking skills. The creating libraries with the potential to enhance and support development of critical thinking skills through media literacy. The learning resources are diverse and can be general books, documentary books, youth literature, augmented reality books, and educational board games would be included as fundamental matters. Undeniably, critical thinking skills can be developed through diverse learning and training methods, using techniques and engaging in various learning activities through learning and practicing the process of knowledge acquisition through media literacy, it would help to foster critical thinking skills and critical reasoning. This can promote cognitive development and critical thinking skills in complex and profound subjects. Additionally, it contributes to development of good judgment in children and adolescents, enabling them to acquire knowledge, understanding, and skills to receive, select, analyze, evaluate, and comprehend impact of media on their behaviours. It aims to empower them to effectively manage and utilize media, as well as to respond and express reasonable opinions.

The framework to develop students' critical thinking skills would foster critical thinking skills through media literacy processes employing school-based learning resources. This approach aims to ensure active participation of individuals in Thai education, including the government, the Ministry of Education, school administrators, teachers, librarians, and educational personnel, as well as raising awareness among parents about the importance of critical thinking skills and media literacy. Noticeably, recognizing value of both in-class and out-of-class learning resources in developing critical thinking skills, which are essential for continuous skill development in the digital era, students become lifelong learners in 21<sup>st</sup> century.

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# **Organizing the pagoda information system to be a Buddhism online learning resource: A case study of Phra Pathom Chedi in Nakorn Pathom Province of Thailand**

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## **ABSTRACT**

This research studied the data of pagoda to organize the pagoda information system as a Buddhist learning center case study at Phra Pathom Chedi in Wat Phra Pathom Chedi Ratchaworamahawihan, Nakhon Pathom Province. The objectives are: 1) to collect data on Phra Pathom Chedi; 2) to organize the Phra Pathom Chedi information system; and 3) to design and develop the Phra Pathom Chedi information system to be a Buddhist learning center. The research was carried out using the research and development method, which had three phases: Phase 1 used document analysis and studied Phra Pathom Chedi in the real area through non-participant observation and recording data to obtain information related to Phra Pathom Chedi. The second phase used the method of analyzing and synthesizing the pagoda data storage system from the existing standard, together with fieldwork to interview experts to gain insights that could be used to explain the contents of the database for the design and development of information systems. The results of the study were: (1) metadata for Phra Pathom Chedi records, which consisted of 18 elements, including the content about Phra Pathom Chedi that would be put into the database; and (2) the information system, which was in the form of a database and webpages to search for Phra Pathom Chedi information that can be used as a source of learning about the Buddhist and use it as a model to extend the scope of the collection of pagodas in the temple to be complete.

**Keywords:** Pagoda database; Metadata for pagoda; Buddhist learning center

## **INTRODUCTION**

A Buddhist learning center is a collection of historical, artistic, and architectural knowledge of ancient artifacts and religious places within the temple. Including information about the teachings Local ceremonies and traditions (Royal Institute, 2013; Phramahaphongthep Paphakaro, 2022) A pagoda can be regarded as a monument of Buddhist learning as it is an architectural structure built for the worship and remembrance of the Lord Buddha and Buddhist teachings and is a sign that indicates the strong faith in Buddhism of Buddhists, resulting in beautiful architectural works of Buddhist art that have been valuable to Buddhism from the past to the present. Pagodas are therefore important to people as a spiritual refuge and a source of excursions in history, Buddhism, art, and local culture. The base of the chedi will consist of a viharn and a balcony, inside which there will be murals, Dharma inscriptions, and various Buddha images, allowing people to study Buddhist arts, which will inevitably lead to learning about history, archaeology, and Buddhist literature. and Buddhist philosophy, which is regarded as a source of deep learning about the Buddhist way. In addition, the surrounding area of the pagoda usually has a peaceful, beautiful, and shady landscape. It is a place of prayer and dharma practice for

both monks and lay people. In addition, the pagoda is also important to the community in terms of being the center of the people in various communities, reflecting their way of life, culture, and local traditions, and preserving local traditions. It is a showpiece of the community. It is a place to practice dharma and pray together for people in the community.

Nakhon Pathom Province is an important civilization with a long history in the land of Suvarnabhumi, according to historical evidence. It is said that Nakhon Pathom is an ancient city that has prospered since the Suvarnabhumi era and was an important capital in the Dvaravati period. In that era, Nakhon Pathom was a source of civilization for India, including Buddhism. Nakhon Pathom is one of the most important ancient cities in Thailand. This can be seen from the existence of many ancient sites and artifacts that are historical evidence up to the present (Nakhon Pathom Provincial Cultural Office, 2022). If considering the things that have been discovered and appeared in Nakhon Pathom Province, it will be found that they are all connected and have roots in Buddhism, thus reflecting the relationship between Nakhon Pathom Province and Buddhism that has been together for a long time.

Phra Pathom Chedi is the oldest Buddhist sanctuary in Thailand. It is believed that the Buddha's relics are enshrined in a temple built in the reign of King Asoka when he ordered the nuncio to preach Buddhism in the land of Suvarnabhumi. Previously known as Phra Thom Chedi, it was the Mahathat Chedi located at Wat Phra Pathom Chedi Ratchaworamahawihan. Nakhon Pathom Province is the first Buddhist pagoda in this region, built in the shape of an overturned bowl like an Indian pagoda. The restoration of the pagoda has been done continuously until the reign of Phrabat Somdet Phra Paramenthra Maha Mongkut Phra Chom Klao Chao Yu Hua (Rama IV) came to worship this pagoda, and when he ascended to the throne, please restore the new pagoda, and wrap the original one in 1853, give it the name Phra Pathom Chedi, and build a vihara and balcony around it. Later, during the reign of Phrabat Somdet Phra Paraminthra Maha Chulalongkorn Phra Chulachomklao Chao Yu Hua (Rama V), he ordered the restoration and construction of the bell tower, which was decorated with tiles until it was completed, and Phrabat Somdet Phra Paramenthra Maha Vajiravudh Phra Mongkut Klao Chao Yu Hua (Rama VI) demolished the northern side of the porch to re-establish Phra Ruangrojanarit Sri Intharith Thammamophas Maha Vajiravudh Ratchapuchanibophit In addition to the Phra Pathom Chedi, in the lower courtyard on the south side of the Phra Pathom Chedi is the main Buddha image. white stone Buddha, which are two of the four sitting Buddha images in the Dharma posture built in the Dvaravati period (Nura, 2011; Chao Phraya Tipakornwong, 2014; Kamtrong, 2021).

From the research of Watcharaphirak (2018) studying the wisdom of tourism management at Phra Pathom Chedi Temple, it was found that information about the history of Phra Pathom Chedi was too little, lacking basic information about ancient objects such as ancient Buddhas and architecture; there is no database; and there is no strategic plan for Buddhist tourism. From the issues, Wat Phra Pathom Chedi Ratchaworamahawihan still lacks the information system of the pagoda. If the pagoda's information system is organized by using information technology to help manage it, it will make people aware and learn appropriately, be able to understand the content, encourage imagination, and inspire. (Thali, 2017) The researcher is therefore interested in studying the information about Phra Pathom Chedi in Phra Pathom Chedi Temple to develop the information system, which is in the form of a database and webpages to search for Phra Pathom Chedi information that can be used as a Buddhist learning source that will allow people to search for information about Phra Pathom Chedi. It also preserves the culture to last forever.

## **Objective**

The three objectives of this study are to: 1) gather information about Phra Pathom Chedi, a Buddhist learning center located in Wat Phra Pathom Chedi Ratchaworamahawihan, Nakhon Pathom Province; 2) organize the information system for Phra Pathom Chedi, a Buddhist learning center; and 3) create

and develop the information system in the form of a database and webpages to search for Phra Pathom Chedi Temple, Nakhon Pathom Province.

### **Research Scope**

The scope of the area research was a study of Phra Pathom Chedi in Wat Phra Pathom Chedi Ratchaworamahawiharn, Nakhon Pathom Province.

### **METHODOLOGY**

This research is research and development (R&D) using a qualitative research process consisting of two methods: content analysis from the document (content analysis) and a visit to the Phra Pathom Chedi data collection area to find ways to organize the information system. The research process is divided into three phases, as follows:

Phase 1 data collection involves analyzing the contents of documents and conducting research related to Phra Pathom Chedi. The Phra Pathom Chedi was studied in the real area by non-participant observation and recorded information about the Phra Pathom Chedi and its components.

Phase 2 organizes the information system to organize the data set for listing the Phra Pathom Chedi. There are two processes: 1) Synthesis of existing metadata by using the Categories for the Description of Works of Art (CDWA) metadata standard and the Fine Arts Department's Archaeological Survey Scheme, selecting the appropriate fields to define as a set. Information for listing Phra Pathom Chedi 2) Study documents and research related to Phra Pathom Chedi and data collection by interviewing additional experts by means of purposive selection sampling (Pothisita, 2021) to obtain insights from experts who provide key information, including curators of the Phra Pathom Chedi National Museum, archaeologists from the Fine Arts Office 2, provosts, teachers, and art history specialists. To adjust the data and create a data set for listing Phra Pathom Chedi with suitable components as a source of learning about the Buddhist method.

Phase 3: Design and develop the Phra Pathom Chedi database to be a learning center for Buddhists.

### **FINDINGS**

From the research procedures and methods, the research results can be summarized as follows:

1. Gathering Phra Pathom Chedi information Elements of Phra Pathom Chedi and analysis of characteristics pagodas by using a document analysis approach according to the features of information resources (Baca & Getty Research Institute, 2016; Zeng and Qin, 2016) in three issues:

1.1 Content means components indicating or showing the nature of the pagoda's knowledge content as internal characteristics that require analysis and interpretation to determine the characteristics, consisting of (1) images (2) names of pagodas; (3) types of pagodas; (4) style Period; (5) legends; (6) traditions; (7) Inscriptions/Marks; and (8) pay respect to the pagoda.

1.2 Context means an element that describes the environment and indicates the creation, storage, and use of pagodas as well as their relationship with other information. (1) location of the pagoda; (2) historical significance (history, pagoda builder, pagoda discoverer) (3) registration information; (4) announcement of the government gazette (5) history of archaeological and conservation operations; (6) possessor; and (7) source of information.

1.3 Structure means an element that indicates or represents the physical aspect of the pagoda as an external aspect that relies on observation or measurement to determine its characteristics,

consisting of (1) materials/techniques description; (2) measurements; and (3) important things in the pagoda area.

2. To organize the information system for listing Phra Pathom Chedi, there were two processes:

2.1 Existing metadata synthesis by using Categories for the Description of Works of Art (CDWA) and the Fine Arts Department's Archaeological Survey Scheme, selecting the appropriate fields to define as a data set for listing for Phra Pathom Chedi, which can be described in detail as follows:

2.1.1 Existing metadata analysis using CDWA (Getty, 2022) As a standard for cataloging artifacts and cultural information resources covering architecture in various building designs, the researcher therefore used the CDWA metadata standard to cover the listing of Phra Pathom Chedi with 31 elements. For this research, the researcher chose to use seven elements because they were related to Buddhist learning centers and some had duplicity with the Fine Arts Department's Archaeological Survey Scheme. Details are shown in Table 1.

**Table 1: CDWA metadata component analysis results**

<b>Element/Sub Element</b>	<b>Element used</b>	<b>Elements that are not used</b>
1. Object/Work	✓	
2. Classification		✓
3. Titles or Names		✓
4. Creation		✓
5. Styles/Periods/Groups/Movements	✓	
6. Measurements	✓	
7. Materials/Techniques Description	✓	
8. Inscriptions/Marks	✓	
9. State		✓
10. Edition		✓
11. Façade		✓
12. Orientation/Arrangement		✓
13. Physical Description		✓
14. Condition/Examination History		✓
15. Conservation/Treatment History		✓
16. Subject Matter		✓
17. Context		✓
18. Descriptive Note		✓
19. Critical Responses		✓
20. Related Works		✓
21. Current Location	✓	
22. Copyright/Restrictions		✓
23. Ownership/Collecting History		✓
24. Exhibition/Loan History		✓
25. Cataloging History		✓
26. Related Visual Documentation		✓
27. Related Textual References		✓
28. Person/Corporate Body Authority		✓
29. Place/Location Authority		✓
30. Generic Concept Authority		✓
31. Subject Authority	✓	




2.1.2 Analysis of Ancient Site Survey Data Patterns of the Fine Arts Department (2010): There are 25 elements used to list, but the researcher used elements that are appropriate to define as a data set for listing Phra Pathom Chedi, amounting to eight elements because they were related to Buddhist learning centers and some had duplicity with the CDWA metadata standard. Details as shown in Table 2.

**Table 2: Results of the Analysis of Metadata Elements of the Fine Arts Department's Historic Site Survey Pattern**

Element/Sub Element	Element used	Elements that are not used
1. Registration number		✓
2. Name 2.1 Official name 2.2 General name 2.3 Former name	✓	
3. Location		✓
4. Territory		✓
5. Location Coordinates		✓
6. The path to the source		✓
7. Priority of ancient sites		✓
8. Types of ancient sites		✓
9. Important things in the ancient site with illustrations	✓	
10. Ancient sites		✓
11. Age/Era		✓
12. Status of ancient sites	✓	
13. Publication of the Royal Gazette	✓	
14. Type of Land		✓
15. Owner		✓
16. Custodian or possessor	✓	
17. Historical significance	✓	
18. Characteristics and forms of architectural art		✓
19. History of Archaeological Operations and Conservation	✓	
20. Current condition		✓
21. Characteristics of current use		✓
22. Conservation Actions		✓
23. Data source	✓	
24. Survey Corps		✓
25. Day/month/year surveyed		✓

2.2 The metadata for Phra Pathom Chedi was obtained from CDWA metadata analysis and the Fine Arts Department's Archaeological Survey Scheme with 15 elements, and from the study of documents and research related to Phra Pathom Chedi and data collected from additional expert interviews, which resulted in three additional elements: the type of pagoda; worship; and related traditions, resulting in a total of 18 elements suitable for listing Phra Pathom Chedi. Details are shown in Table 3.

**Table 3: Metadata for Phra Pathom Chedi**

Element/Sub Element	Description
1. Image	
2. Name 2.1 Official name 2.2 General name 2.3 Former name	Phra Pathom Chedi (พระปฐมเจดีย์) Ong Phra Pathom Chedi (องค์พระปฐมเจดีย์) Phra Thom Chedi (พระธมเจดีย์)
3. Type of pagoda	Mahathat Chedi (มหาธาตุเจดีย์)
4. Style Period	Dvaravati art, 12th - 14th Buddhist century
5. Status of the ancient site	Register an ancient site
6. Gazette Announcement	Subject: Determination of ancient land boundaries, Volume 52, Chapter 75, dated March 8, 1935.
7. Materials/Techniques Description	<p>The current Phra Pathom Chedi was built from 1600 until 1853 as a bell-shaped pagoda influenced by Lankan art. It looks like an inverted bell with a wide mouth. The structure is made of logs tied with a huge chain, bricked with cement, and decorated with tiles overlaid. According to the Indian style of the Ashoka era, about 350–1000 B.C., and the ancient Khmer pagoda, about 1000 B.C.–1600 B.C., the pagoda has three elements:</p> <ol style="list-style-type: none"> <li>1) The base part consists of the Prathaksin layer, which is a brick base made of cement. The base is like a column. There is a courtyard around the pagoda, and there are stairs leading up to the four corners of the palace, consisting of the Phra Pathom Chedi, the Phra Wihan, the balcony, the bell tower, the Chinese Pavilion, the Dharma Hall (Phra Pathom Chedi Museum), the chapel, the pavilion, the Phra Pathom Chedi replicas and relics of Nakhon Si Thammarat City, white stone Buddha images, Phra Maha Bodhi, as well as important trees that should be worshiped, including banyan trees, cedar wood, jig wood, and wood nests.</li> <li>2) The central part of the pagoda is the bell. It is round; the mouth of the pagoda is made of masonry and decorated with orange glazed tiles, located on the base of the pagoda, resting above the base, forming parapets above the wall continuously in a circle surrounding the pagoda. Above the base of this level is another tier of pedestal that supports the lotus tier and the 3-tier stacked lotus tier. The eastern side of the glass lotus flower has been made into an arch to enshrine a replica of the Buddha image.</li> <li>3) The peak is located above the bell. It consists of a throne with a rectangular base supporting a tiered stem and pillars. Above it is a lotus lid and the top of the segment, separated by 27 segments of wire, topped with the top of the lotus bowl and dewdrops. The top</li> </ol>

	of the pagoda is decorated with a crown placed above the top of Naphasul.
8. History of archaeological and conservation operations	<p>A.D. 1853–1867: King Rama IV graciously initiated the restoration of the Phra Pathom Chedi, including the restoration of other buildings around the Phra Pathom Chedi area, including the Ubosot, the four directions viharn, and a balcony around the viharn.</p> <p>A.D. 1888–1909: King Rama V restored Phra Pathom Chedi by adorning new tiles (the tile decoration was not completed until the end of the reign). There was a repair of the reclining Buddha image, the Nirvana Buddha image, and the restoration of various parts of the viharn.</p> <p>A.D. 1910–1924, King Rama VI decorated the tiles, which are still a work in progress under King Rama V. In addition, His Majesty repaired and made various things in the Grand Hall, brought Phra Ruangrojanarit to be enshrined at the birth hall, and repaired the Ubosot.</p> <p>A.D. 1928–1932 King Rama VII graciously restored the new Ubosot.</p> <p>A.D. 1953–1981 King Rama IX had the Phra Pathom Chedi glass wall and wooden doors in all four directions built. In 1967, the Fine Arts Department found a piece of a white stone Buddha image, assembled into a body, and enshrined it at Phra Pathom Chedi. Phra Pathom Chedi was restored by the Department of Public Works, Ministry of Interior, and the Fine Arts Department, Ministry of Education, which have been renovated since April 7, 1975, and ended on May 15, 1981.</p>
9. Measurements	Height from ground to top: 120 meters, 45 centimeters
10. Provenance	<p>Phra Pathom Chedi is one of the oldest sacred places in Thailand. It is a place of worship for Buddhists around the world. It is assumed that the Buddha's relics are enshrined in a stupa built during the reign of King Asoka the Great, who sent envoys to propagate the religion, namely Phra Sona Thera and Phra Uttar Thera, who was an apostle and came to set up evidence to announce the doctrines at Nakhon Pathom for the first time in the 3rd century AD and built a stupa with an overturned bowl in the Sanchi style stupa in India. Later, an ancient Khmer pagoda was built to cover the original pagoda when King Mongkut, Rama IV, during his monkhood, went on a pilgrimage to pay respects. His Highness saw it as a pagoda with a height of 42 wa. When he entered the monkhood, having taken the throne in 1853, he ordered a new pagoda to be encased in the original one, 120 meters high and 45 centimeters high, along with a viharn and balcony built by time. The work was not completed on time. Later, King Rama V ordered the restoration and construction of the bell tower. and decorate the tile until it's done. When it came to the reign of King Rama VI, the Grand Hall was restored. Painting the original pagoda and various pictures on the wall and building a new one to enshrine Phra Ruangrojanarit Sri Inthrahit Thammamophas Maha Vajiravudh Ratchabuchaniyapphit and King Rama VII ordered the construction of a new ubosot (Nura, 2011; Chao Phraya Tipakornwong, 2014).</p>
11. Possessor	Wat Phra Pathom Chedi Ratchaworamahawihan Nakhon Pathom Province

12. Important things in the ancient site

12.1 Name

12.2 Illustration



The east temple and its interior



south temple



Inside the West Temple



north temple



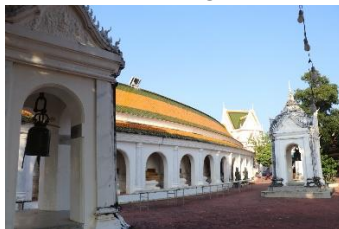
Phra Ruang Rojanarit



The corridor connects the temple to the north and the inner part contains inscriptions of Dharma



The outer balcony houses 80 Sukhothai-style Buddha images, comprising 66 Buddha images, 8 birthday images, and 6 other images



The bell tower is on the outside of the balcony between the 4 directions of the temple, there are 24 houses



Chinese Pavilion or Phra Pathom Chedi Shrine



Rong Thammarat or Wat Phra Pathom      Chapel Chedi Museum



Rostrum and stairs leading up      The Phra Pathom Chedi replicas



Relics of Nakhon Si Thammarat City      White stone Buddha



Ton Chan (Rama 10, planted in 1997)      Si Maha Bodhi tree

13. Inscriptions/Marks

There are 120 inscriptions on the wall of the balcony covering Phra Pathom Chedi, starting from Room 1 from the Grand Hall on the east side to the South Hall (30 rooms), from the South Hall to the West Hall (30 rooms), from the West Hall to the North Hall (Viharn Phra Ruang) (30 rooms), from the northern viharn to the eastern viharn (30 rooms), totaling 120 rooms. (Sirindhorn Anthropological Center (Public Organization), 2007)

Room 1 inscriptions are incantations praising the Lord Buddha and reasons for inscribing Dharma incantations. Including the first Dharma chapter

Rooms 2–66 are Dhammapada spells.


Rooms 67–96 are the spells in the Scriptures, volume 25.

Rooms 97–115 are texts from the Tripitaka, volume 25, Parayanaka.

Rooms 116–120 are the spells from the Tripitaka, volumes 14–15 & 20.

Information and readings—translations of all the inscriptions on the balcony around Phra Pathom Chedi. It is published in the 1985 book *Inscription at Phra Pathom Chedi with two readers*, namely Siri Petchchai, who at that time was the inspector of the Department of Religious Affairs. Read the inscriptions in rooms 1–66, and Jet Preechanon read the inscriptions in rooms 67–120. The translation is taken from the Tripitaka of



	the Department of Religious Affairs and the books of Mahamakut's College.
14. Worship	 <p>Namo Tassa Bhakawato Arahato Sammasambuddhassa (3 chants)  นะโม ตัสสะ ภะคะวะโต อะระหะโต สัมมาสัมพุทธัสสะ (สวด 3 จบ)</p> <p>Ahang wantami thatyo ahang wantami sabbaso ahang sukhito homi  อะหัง วันทาமி ธาตุโย อะหัง วันทามิ สัพพะโส อะหัง สุขิโต โหมมิ</p> <p>I take refuge in the Buddha, the Dharma, and the Noble Sangha. I pay my respects Worship the mercy of the Lord Buddha, who has sacrificed and accumulated countless prestige, gained enlightenment with prostration to the Dhamma and the Noble Sangha Let's pray by the virtue of this merit, be a factor to attain nirvana, even in any existence. I would like to be born under the shadow of the Buddha's observance, to meet the faithful, to have good knowledge of the Dharma, to have good karmic relations, to be born among good friends, far from bullies, to have the opportunity to listen to the Dharma and to practice the Dharma. Until becoming a factor to grow with consciousness and wisdom according to this life and the next life until nirvana in the right time. Any karma that has violated the Buddha, the Dhamma, the Noble Sangha and all beings in the past life, whether in the present life or not. I bow down and ask for forgiveness for all of them. I would like to dedicate merit to those who have benefactors, relatives, karma, as well as you who are striving in the right activities to maintain the nation, Buddhism, and the King, both human and human. I wish all of you who have said that name to be happy for all of you.</p>
15. Location 15.1 Address  15.2 Coordinates	<p>Wat Phra Pathom Chedi Ratchaworamahawihan 27 Thesa Road, Phra Pathom Chedi Subdistrict, Mueang Nakhon Pathom District, Nakhon Pathom Province 73000</p> <p>Lat: 13.8189147  Long : 100.0560242</p>
16. Related legends or tales	<p>The Legend of Phra Pathom Chedi, Phraya Ratchasampharakon Edition and the Tapakhaorot version (Chaophraya Tipakornwong, 2014)</p> <p>There was a king who reigned in Si Wichai (namely Nakhon Chai Si) named Phraya Kong. His wife was pregnant and gave birth to a son, while his servants brought him to bear the child. Accidentally, the edge of the Phan hit the child's forehead, resulting in a scar, so he was named "Phra Ya Phan". The fortune teller predicted that when he grew up, the child would have great</p>

	<p>merit but would kill the patriarch, killing his own father, causing the young child to be abandoned in the middle of the forest. Grandma Phrom met him, and she took pity on her and raised him. Later, Grandma Phrom gave the little boy to her sister, Grandma Hom, as a foster caregiver because she saw that Grandma Hom had no children.</p> <p>When Phraya Phan grew up, he learned magic until he succeeded and had the opportunity to defeat the elephants that chased and attacked people in Sukhothai. The King of Sukhothai saw the merits and saw that Phraya Phan had the character of a meritorious person, and he accepted him as an adopted son. Later, the king of Sukhothai wanted to expand the territory and consolidate Nakhon Chai Si as a colony, so Phraya Phan, his adopted son, fought against elephants with Phraya Kong. Phraya Kong was very angry that a young general came to challenge him to battle and immediately ordered an army to be organized. Along the way, a broken Bodhi branch fell on many dead soldiers as if it were an omen. The place where the Bodhi branch was broken was later called "Ban Pho Hak". Finally, an unexpected story happened in Nakhon Chai Si. The two armies moved to face each other. There was a battle of martial arts. In which both parties do not know that they are father and son. Phraya Kong drives an elephant into Phraya Phan's elephant but fails, being slashed by Phraya Phan with a jab on the elephant's neck. Phraya Kong's army was completely defeated. The place where Phraya Kong's neck was cut off is presently Thanon Khad Sub-district, Mueang District, Nakhon Pathom Province.</p> <p>Phraya Phan invaded Nakhon Chai Si and wanted to take over Phraya Kong's wife as the traditional wife of the victor. The deva saw that it was immoral and transformed herself into a young mother cat that blocked the stairs leading to the queen's castle. While Phraya Phan stepped over two mother and child cats, the kitten said, "You saw me as a beast. So, you crossed over us." The mother cat replied, "Lastly, being brutes, even your mother would take you as a wife." Phraya Phan then prayed that if the queen was really his mother, let the milk flow from both breasts. His wife saw the scar on his forehead and immediately knew that Phraya Phan was his son. The Queen therefore tells Phraya Phan the whole story. Phraya Phan is very sad that she killed her biological father and is angry that Grandma Hom hides the truth with anger. She orders Grandma Hom to kill her at the place where Grandma Hom died. He excavated an octagonal pillar with a Dvaravati pattern at Wat Noen Phra. At present, it has been moved to Wat Don Yai Hom. When Phraya Pan realized that he had committed a great sin, including killing his father and killing Grandma Hom, who is like a mother, he held a meeting of the Arhats to find a way to redeem himself and built a large stupa as high as a flying bird according to the advice of the Arhat, Phra Pathom Chedi, in order to relieve some of the sins that killed the father, which is considered the highest ancient sanctuary in the land of Suvarnabhumi, and built a pagoda to atone for the sin of killing Grandma Hom.</p>
17. Related traditions	Traditions related to Phra Pathom Chedi are as follows (Nakhon Pathom Provincial Cultural Office, 2018; Burapha University, 2022)

	<p>1) The tradition of worshipping Phra Pathom Chedi is a tradition that has been passed down for a long time so that Buddhists can worship the relics contained within the Phra Pathom Chedi and worship Phra Ruang Rojanarit, the ancient Buddha image that is invaluable to Nakhon Pathom. The event started during the reign of King Rama IV after His Majesty ordered to renovate the Phra Pathom Chedi in a big way and to dig a canal for the pagoda. From Ban Thana to the center of Nakhon Pathom Chedi to use as a route to worship Phra Pathom Chedi, the temple has scheduled a festival to worship Phra Pathom Chedi from the 12th day of the 12th lunar month to the 5th day of the 12th lunar month, totaling 9 days and 9 nights. Every year, there will be traditional merit-making activities such as gilding important Buddha images of the temple in all four directions and replicas of Phra Ruang Rojanarit. Make merit and donate assets according to the power of faith. The organization of Phra Pathom Chedi worship shows that it is very important to the people of Nakhon Pathom and Thai Buddhists. As can be seen from the many people who have faith, come to make merit, and visit this event every year, it should be promoted and preserved forever to preserve good traditions and culture and create unity among the people.</p> <p>2) The Phra Pathom Chedi Blanket Procession Festival is part of the Phra Pathom Chedi Worship Ceremony, which has existed since the reign of King Rama IV. The Triple Gems, by offering a saowaphat cloth, which is a garment, will gain great merit. Therefore, Buddhists prefer to offer such clothes. In the early days, the offering of blankets to the Buddha image might not have been held in a parade, and more long blankets might have been arranged to be worn like nowadays. Instead, it would be the saffron cloth that ordinary monks wore to offer according to their faith and then hired someone to bring it. Later, seeing that doing this was inconvenient, it was changed to bring together a long piece of cloth that had been donated and bring it up to cover it at once. The blanket must be 80–100 meters long. The temple therefore pays merit to the faithful in the form of a procession in which the participants will dress beautifully, such as in Thai dress, angel dress, and angel dress, to make the event interesting and entertaining. The activities of the Buddha blanket procession will begin on the opening day of worshipping Phra Pathom Chedi. The procession will begin in front of the Phra Ruangrojanarit, circle around the Phra Pathom Chedi, and then circle back to the starting point again. Then the Buddha's blanket is placed on a wooden pillar for the faithful to write a dedication for 3 days and then bring that cloth to circulate Thaksinawat around the Buddha 3 times. The neck part of Phra Pathom Chedi is the end of the ceremony.</p>
18. Source of Information	<p>Fine Arts Department. (1990). <i>Ancient registrations throughout the kingdom, volume 1(2004-1980)</i>. Fine Arts Department.</p> <p>Chao Phraya Tipakornwong (2014). <i>Phra Pathom Chedi.Thammathee</i>.</p> <p>Nura. (2011). <i>The most knowledgeable in Thailand</i>. Thai Quality Books Company.</p> <p>Samran, Peerapat. (2004). <i>Concepts and symbols in architectural design of Phra Pathom Chedi</i> [Master's thesis, Silpakorn University]. <a href="http://www.sure.su.ac.th/xmlui/handle/123456789/2789">http://www.sure.su.ac.th/xmlui/handle/123456789/2789</a></p>



	<p>Burapha University (2022, August 29). <i>Local customs and traditions in Nakhon Pathom Province</i>.  <a href="http://digital_collect.lib.buu.ac.th/dcms/files/00959/appendix%28168-217%29.pdf">http://digital_collect.lib.buu.ac.th/dcms/files/00959/appendix%28168-217%29.pdf</a></p> <p>Sirindhorn Anthropology Center (Public Organization). (2007, July 4). <i>Inscription on the balcony covering Phra Pathom Chedi</i>.  <a href="https://db.sac.or.th/inscriptions/inscribe/detail/2753">https://db.sac.or.th/inscriptions/inscribe/detail/2753</a></p> <p>Saising, Sakchai. (2017). <i>Pagodas in Thailand: Form, Development and Power Faith</i>. Ancient City.</p> <p>Office of Buddhism, Nakhon Pathom Province. (2022, October 8). <i>Wat Phra Pathom Chedi RatchaWoramahawiharn</i>.  <a href="https://npt.onab.go.th/th/content/category/detail/id/110/iid/646">https://npt.onab.go.th/th/content/category/detail/id/110/iid/646</a></p> <p>Nakhon Pathom Provincial Cultural Office. (2018, August 29). <i>Phra Pathom Chedi Worship Ceremony</i>. <a href="https://www.m-culture.go.th/nakhonpathom/ewt_news.php?nid=442&amp;filename=index">https://www.m-culture.go.th/nakhonpathom/ewt_news.php?nid=442&amp;filename=index</a></p> <p>Leksukum, Santi. (2009). <i>Pagoda Background and Vocabulary</i>. Matichon.</p>
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3. As a result of the design and development of the Phra Pathom Chedi database, the researcher has studied the system development life cycle (SDLC) concept (Udomthanathira, 2019) to apply it to the design and development of the database of Phra Pathom Chedi. The process of designing and developing the system is divided into 3 steps, as follows:

3.1 The process of studying the requirements of the system (collecting and documenting stakeholder requirements) by studying the needs of users consisting of curators of Phra Pathom Chedi National Museum, archaeologists, and Fine Arts Department 2, in which both groups of users cover design and content development in databases and websites.

3.2 The design phase is to meet the needs of users. The researcher applied user information needs and content design through data analysis to develop a dataset for Phra Pathom Chedi's pagodas. There are 18 appropriate elements to describe in detail Phra Pathom Chedi, to design a database system and website structure to prioritize content, and to design the display section. At this stage, a programmer will help design and lead the creation and development in the next step.

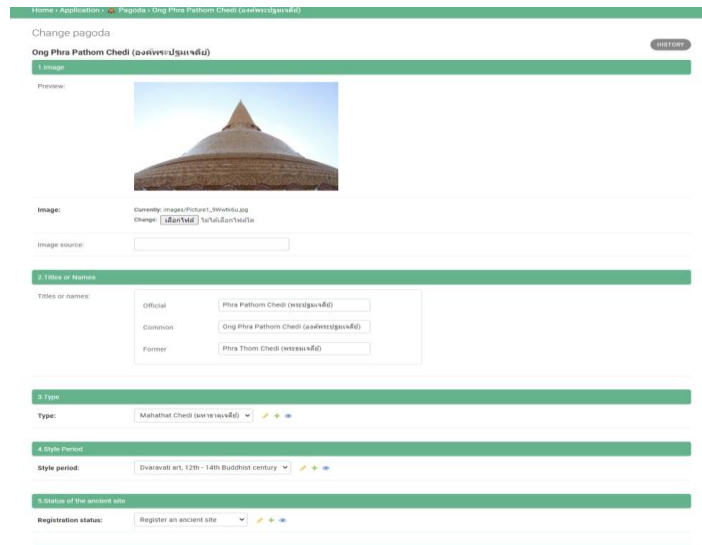
### 3.3 Development Process

3.3.1 Use the phpMyAdmin program to develop the database.

3.3.2 Use the Visual Studio Code program to develop the front-end of a website. And use the programming languages Python, JavaScript, HTML, and CSS to write commands.

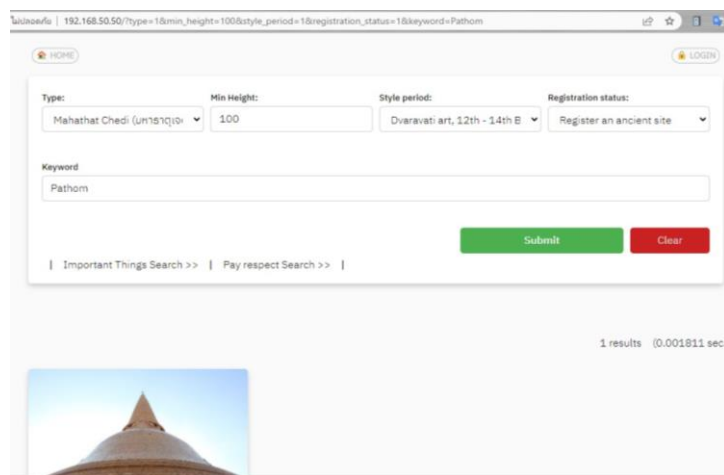
4. Database of Phra Pathom Chedi, Phra Pathom Chedi Temple, Nakhon Pathom Province, as a source of Buddhist learning. According to the design and development of the Phra Pathom Chedi database, there will be 2 parts: the database for those responsible for maintaining the database and the website for users, whose details are as follows:

4.1 Database part that has a person responsible for maintaining the database. After logging in, there will be a menu for using and managing various parts of the system, including adding data and editing data, where the database administrator can enter information according to the elements of the pagoda that have been studied and determined as the sample picture.



The picture shows the screen adding new pagoda information according to the elements that have been defined.

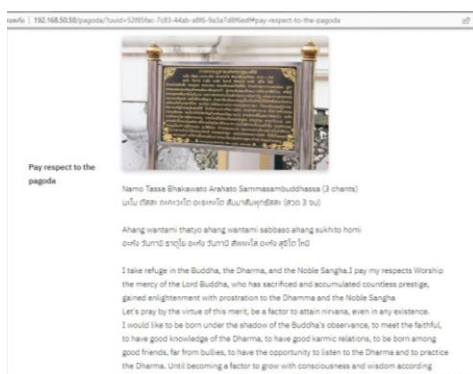
4.2 The display page for the display user displays both images and text. The user can click on the desired image, and you can use many search channels, such as keywords, types, heights, provinces, eras, words of worship for the pagodas, registration status, and important things around the base of the pagoda both ancient sites and antiquities, as shown in the sample picture.



The picture shows many search channels.



The picture shows a review of the search results that can be obtained with both image and text information.



The picture shows the result of searching for to pay respect to the pagoda.



The picture shows the result of searching for to pay traditions.

## CONCLUSION

This research is research and development (R&D) with the main objectives of presenting data analysis to develop a data set for Phra Pathom Chedi and the design and development of the Phra Pathom Chedi database. The study found that the data analysis to develop the dataset for listing Phra Pathom Chedi was done by synthesizing the existing metadata by choosing Categories for the Description of Works of Art (CDWA) and the data survey scheme for ancient sites of the Fine Arts Department, including studying documents and research related to Phra Pathom Chedi and collecting data from interviews with experts to gain insights that can be used to explain Phra Pathom Chedi's contents. It was found that 18 elements of data for listing Phra Pathom Chedi were appropriate. In terms of database design and development, the researcher studied the system development life cycle (SDLC) concept and applied it to the design and development Phra Pathom Chedi Database, the system design and development process is divided into 3 steps as follows: 1) Collecting and documenting stakeholder requirements 2) Design; 3) Development. The result of the design and development will be an appropriate pagoda

database to be a source of learning for the Buddhists—a case study of Phra Pathom Chedi, Phra Pathom Chedi Ratchaworamahawihan Temple, Nakhon Pathom Province.

## SUGGESTION

### 1. Suggestions for applying the research results

1.1 To serve as a resource for lifelong learning for students and the general public in order to support the preservation of cultural values and national identity, and to serve as a learning center for scholars and those who are interested in learning about Phra Pathom Chedi's art and religion through databases and websites where everyone can access the knowledge at any time.

1.2 According to related agencies such as the National Museum, Phra Pathom Chedi, Western Region Information Center, Nakhon Pathom Provincial Cultural Office, and Nakhon Pathom Provincial Office of Tourism and Sports, the results of the research can be used to disseminate knowledge about Phra Pathom Chedi, promote tourism, and increase community income.

1.3 It is a prototype system to expand the scope of collecting pagoda data for the temple.

### 2. Recommendations for further research

The database's data should be transformed into three-dimensional virtual media and supported on portable electronics like smartphones and tablets.

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# Effect of Media Literacy in Public Libraries on Closing the Digital Divide

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## ABSTRACT

This research empirically analyzed the effect of public library use and media literacy on closing the evolving digital divide, from quantitative digital divide to smart divide. As a result, most of the factors of media literacy and public library use affect closing quantitative, qualitative, intellectual, and smart divide. Specifically, the use of various media had a positive effect on closing the quantitative and qualitative digital divide. Media accessibility, media diversity, and the capability of evaluating information affect the acquisition of reliable information through media, which effect on closing the intellectual digital divide and smart divide. Especially, the use of smart devices facilitates people's social activities, which effect on closing smart divide. Based on these results, it was identified that media literacy services provided by public libraries have an overall positive effect on closing various types of digital divide, including the quantitative, qualitative, and intellectual divide. It can also play an important role in closing the smart divide in a specified and complex form.

**Keywords:** Media literacy, Digital divide, Smart divide, Public library

## INTRODUCTION

The digital divide goes beyond inequality at the individual level and leads to social inequality, which resulted in the negative effects such as economic and social disparities throughout society. The digital divide has currently become more complex and subdivided, and continues to evolve from the quantitative digital divide to the smart divide along with the development of information technologies. Thus library communities have provided various information services to close the digital divide as a social problem.

One of the effective ways to close the digital divide is to allow people to achieve capabilities of literacy. In this reason, public libraries have provided various services for community members to enhance their literacy. Among the various types of literacy, media literacy has become more important because of the rapid development and broad dissemination of media devices. However, it is necessary to verify the effectiveness of the media literacy services of public libraries whether they are actually closing various types of digital divide. In this reason, this research empirically analyzes whether media literacy services of public libraries close various types of digital divides. Based on the analysis, this research proposes the considerations and approaches to closing the evolving digital divide when public libraries provide media literacy services.

## **THEORETICAL BACKGROUND**

### **Evolution of the Concept of the Digital Divide**

The term digital divide is coined by Gary Andrew Pole, a New York Times reporter, in 1995. The term traditionally refers to the gap between those who have information (information-haves) and those who have not (information-have-nots) (OECD, 2001, 4). However, it is not just a gap in access to information, but also affects social and economic gaps (Houston & Erdelez, 2004). Thus the digital divide has been recognized as a social phenomenon and one of the problems to be resolved since the late 1990.

In the early stages, the digital divide was mainly due to the disparity in ownership and access to ICT and digital devices (Helbig, Gil-Garcia, & Ferro, 2009; Keniston, 2004). As new information devices and media were widely distributed, however, the digital divide has been continuously converted into a more complex structure relying on the utilization of information. From this perspective, several research have categorized the digital divide into quantitative digital divide caused by access to ICT and qualitative digital divide caused by the disparity in the capability of using ICT among those who already have access to them (Dewan & Riggins, 2005; Wei et al., 2010).

### **Intellectual Divide and Smart Divide**

The quantitative and qualitative digital divide which focusing on ICT and media is evolving into the intellectual digital divide that focuses on the capability of creating values of the information acquired. This refers to the gap that focuses on information literacy rather than accessibility to information. Thus, this evolved digital divide is caused by the capability whether tangible or intangible value of information can be created (Hidalgo, Gabaly, Morales-Alonso, & Uruena, 2020).

The intellectual digital divide, which focuses on the creation of value and information utilization, is currently evolving into a more diversified smart divide due to the wide dissemination of smart devices. The term smart divide is coined in a research by Lee (2016). It refers that there is an informational and social disparity between those who can fully utilize the functions of smart devices and those who cannot. This can be seen as a gap in a different aspect from the traditional digital divide focusing on access to or use of ICT media. It is defined as the evolved intellectual gap caused by the capability of using various functions of smart devices (Lee, 2016).

If the traditional digital divide is the inconvenience caused by the inability to utilize ICT, the evolving digital divide goes beyond simple inconvenience and expands to disparities in economic, social, cultural, and informational status, leading to various types of social inequality (Park & Lee, 2015). Thus, it is necessary to consider a more in-depth approach to close the smart divide as a social problem.

### **Media Literacy**

With the rapid evolution of information technology and the broad dissemination of information media since the 2000s, the ability to use and understand media, which is media literacy, is becoming more important (Allan, 2014; Ritchie, 2011). Media literacy can be considered as the ability to access, analyze, evaluate, produce, and communicate various forms of information using all types of media (Hobbs, 2010; National Association for Media Literacy Education, 2011; Partnership for 21st Century Skills, 2002;). From this perspective, the core of media literacy is the ability to read and write messages provided by various media, the ability to critically analyze, evaluate, and reflect on media texts (Lee, 2020), and the capability of critical thinking (Hobbs, 2010). It can allow people to communicate with others and participate in social activities using media (Koltay, 2011).

Media literacy is not limited to the use of media at the individual level, but also has an effect on

causing or closing the social and informational disparities generated by the ability to use various types of media, including smart devices. Thus, public libraries as a social and informational institute have provided various media literacy programs to allow people to enhance their capability of media use and to support their information activities. In current, public libraries are considered as core institution to close social and informational disparities by providing various media literacy services. However, it is not clear whether public libraries actually contribute to allow people to achieve media literacy and to close various digital divide through media literacy services. In this reason, this research aims to empirically verify how media literacy services by public libraries affects closing the various types of digital divide.

## **RESEARCH METHODOLOGY**

In order to empirically identify whether media literacy programs and services of public libraries effect on closing the evolving digital divide, this research conducted a survey targeting public library users. The core factors of media literacy, digital divide, and public library use were extracted to construct survey questionnaires.

The factors of media literacy include diversity in media use, evaluation of the value of information acquired through media, capability of information creation, and diversity of content being used (EAVI, 2008; Hallaq, 2016; Potter, 2010; Ritchie, 2011). These factors were set as independent variables.

Regarding the digital divide, the aspects that commonly applied to all types of digital divide were extracted as the factors of digital divide from quantitative digital divide to smart divide. These include the use of media, familiarity of using information, ability to obtain necessary information, and the social activities using information through media. They were set as dependent variables.

In addition, the factors of public library use were established, which include degree of library use, library media facility use, participation of library programs, and improvement of social life through library services.

A structured survey questionnaire was constructed using the variables aforementioned. The survey was conducted online for about two weeks from August 30 to September 14, 2022, targeting public library users. Among the collected 336 responses, 325 responses were used for analysis, excluding incomplete responses. Pearson's Correlation and multiple regression analysis were conducted using SPSS 26.0 to analyze the collected data (Cronbach's alpha = 0.850).

## **FINDINGS**

### **Correlation Analysis between Media Literacy and the Digital Divide Factors**

The factors of media literacy show a significant correlation with all factors of digital divide. In particular, utilization of media functions and the diversity of media use show a high correlation. From this perspective, utilization of functions of various media can be explained as affecting quantitative and qualitative digital divide. On the other hand, formation of social relationship using media did show relatively low correlation with the factors of media literacy. It showed a significant correlation with familiarity of media use and social utilization of information. In addition, the use of smart devices shows significant correlation with the factors of media literacy, which can be considered that media literacy is related to the smart divide.

Based on these results, it can be explained that the factors of media literacy are closely related to the quantitative and qualitative digital divide. In this regard, this research empirically verifies how the factors of media literacy and the factors of public library use actually affect various types of digital divides.



## Effect of Media Literacy in Public Libraries on the Digital Divide

### *Effect of Media Utilization on the Digital Divide*

Multiple regression analysis was conducted to empirically verify the effect of media literacy in public libraries on the digital divide. As a result of the analysis, it was found that the diversity of media use and the ability to create information using media ( $r=.000$ ,  $p<.01$ ) had positive effect on the ability to utilize the functions of media devices. In addition, media access also shows positive effect on the ability of using media functions ( $r=.006$ ,  $p<.05$ ). Based on these results, it can be explained that the higher the capability of creating information through media, the more media functions can be utilized. Thus achieving media literacy can positively effect on closing qualitative digital divide. In contrast, library use did not show significant effect on the factors of digital divide (see Table 1).

**Table 1. Effect of media literacy on the utilization of media functions**

		Coefficients <sup>a</sup>				
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.280	.289		.971	.332
	Library use	-.144	.047	-.055	-.945	.346
	Library media equipment use	-.027	.066	-.024	-.406	.685
	Library program use	.112	.076	.082	1.480	.140
	Social improvement	.084	.051	.091	1.647	.101
	Media access	.205	.074	.169	2.758	.006
	Diversity of media use	.408	.074	.339	5.48	.000
	Evaluation of reliability	-.056	.082	-.042	-.684	.494
	Creation of information	.260	.065	.238	3.999	.000
	Social relationship using media	.032	.056	-.028	-.567	.571

a. Dependent Variable: Utilization of the functions of media

In addition, the disparity in the quantitative aspect of access to media and the diversity of media use still exists. The capability to create information through media can be seen as affecting the quantitative and qualitative digital divide. In order to bridge this disparity, public libraries need to provide the informational environment with facilities and equipment that can allow people to access media and utilize them. It is also necessary for public libraries to provide media literacy programs that can support the capability to create information and utilize diverse functions of media devices.

### *Effect of Information Acquisition through Media on the Digital Divide*

How much information is acquired and how reliable those information is closely related to social and information activities. Thus how the degree of information acquisition through media affects which type of digital divide was analyzed. As a result, the degree of information acquisition was affected by social roles of public libraries ( $r=0.46$ ,  $p<.05$ ), media accessibility ( $r=.000$ ,  $p<.01$ ), media diversity ( $r=.000$ ,  $p<.01$ ), and evaluation of information reliability ( $r=.002$ ,  $p<.05$ ). Based on these results, social roles of public libraries affect quantitative and qualitative digital divide. Media literacy positively affects quantitative access to media and qualitative evaluation of the value of information acquired. Thus media literacy effects on quantitative, qualitative, and intellectual digital divide (see Table 2).

**Table 2. Effect of media literacy on the utilization of media functions**

Coefficients <sup>a</sup>						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1 (Constant)	.640	.240		2.6661	.008	
Library use	-.040	.039	-.058	-1.033	.303	
Library media equipment use	-.019	.055	-.020	-.351	.726	
Library program use	.014	.063	.012	.217	.829	
Social improvement	.085	.043	.105	1.999	.046	
Media access	.290	.062	.273	4.679	.000	
Diversity of media use	.264	.062	.251	4.253	.000	
Evaluation of reliability	.208	.068	.177	3.062	.002	
Creation of information	.081	.054	.084	1.491	.137	
Social relationship using media	-.041	.047	-.042	-.882	.378	

a. Dependent Variable: Degree of information acquisition

It was identified that digital divide still exists when using various media and evaluating the reliability of information. Thus achieving media literacy has a positive effect on closing the intellectual divide. In addition, the use of public libraries is found to provide an environment that can close the intellectual digital divide. Thus it is necessary for public libraries to provide intellectual environment that can support to achieve media literacy which facilitates the qualitative and intellectual acquisition of information through various media.

#### *Effect of Information Utilization through Media on the Digital Divide*

Media accessibility ( $r=.000$ ,  $p<.01$ ), diversity of media being used ( $r=.000$ ,  $p<.01$ ), and ability to evaluate the reliability of information ( $r=.000$ ,  $p<.01$ ) positively affect the degree of information utilization. These results show that utilization of information obtained through media affects quantitative, qualitative, and intellectual digital divide (see Table 3).

In contrast, the use of public libraries and formation of social relationship did not affect the utilization of information. From this results, it can be explained that the utilization of information acquired through media is usually performed at the individual level. However, information utilization and evaluating the value of the information requires media and intellectual environment. Thus public libraries should consider how to support the utilization of information at the individual level and how to facilitate information utilization at the social level, which can be connected to the approaches to close various digital divide.

**Table 3. Effect of media literacy on the degree of information use**

Coefficients <sup>a</sup>						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1 (Constant)	.784	.234		3.357	.001	
Library use	-.007	.038	-.010	-.176	.861	
Library media equipment use	.009	.054	.010	.171	.864	
Library program use	-.026	.062	-.022	-.416	.678	
Social improvement	.053	.041	.068	1.277	.203	
Media access	.233	.060	.229	3.864	.000	

Diversity of media use	.261	.060	.259	4.331	.000
Evaluation of reliability	.291	.066	.259	4.404	.000
Creation of information	.013	.053	.014	.246	.806
Social relationship using media	-.047	.045	-.050	-1.030	.304

a. Dependent Variable: Degree of information acquisition

#### *Effect of Social Utilization of Information on the Digital Divide*

Accessibility to various media ( $r=.000$ ,  $p<.01$ ), and ability to evaluate the reliability or value of information ( $t=.002$ ,  $p<.01$ ) were found to have a significant effect on people's social utilization of information. Social improvement by using public libraries ( $r=.043$ ,  $p<0.05$ ) was also found to have a positive effect on people's informational and social utilization of information. In particular, the use of smart devices has a positive effect on participation in social activities through various media. Thus it was found that the facilitation of media literacy can provide a positive effect on closing the smart divide. In addition, accessibility to media and evaluation of the reliability of information obtained through media affect to close the qualitative digital divide. Thus public libraries need to consider how their users utilized information from social as well as individual level, which can be connected to bridge social disparities (see Table 4).

**Table 4. Effect of media literacy on social utilization of information**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.218	.248		4.903	.000
	Library use	.007	.040	.010	.164	.870
	Library media equipment use	-.009	.057	-.010	-.153	.879
	Library program use	.015	.065	.014	.230	.818
	Social improvement	.089	.044	.119	2.030	.043
	Media access	.226	.064	.229	3.529	.000
	Diversity of media use	.126	.064	.129	1.963	.051
	Evaluation of reliability	.225	.070	.206	3.195	.002
	Creation of information	-.015	.056	-.017	-.273	.785
	Social relationship using media	.065	.048	.071	1.337	.182

a. Dependent Variable: Social utilization of information

#### *Effect of Evaluation of Information Value on the Digital Divide*

significant effect on the evaluation of the value of information. Evaluation of information reliability ( $r=.034$ ,  $p<.05$ ) also have effect on evaluating information acquired through various media. From the perspective of library use, the roles of social improvement of people affect the evaluation of information value ( $r=.026$ ,  $p<.05$ ). In contrast, other factors of library use did not affect the evaluation of information value (see Table 5).

**Table 5. Effect of Information Evaluation on social utilization of information**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	1.011	.252		4.015	.000
	Library use	-.050	.041	-.074	-1.223	.222
	Library media equipment use	.016	.058	.017	.278	.781
	Library program use	-.004	.066	-.003	-.053	.958
	Social improvement	.100	.045	.126	0.233	.026
	Media access	.251	.065	.242	3.856	.000
	Diversity of media use	.228	.065	.223	3.518	.000
	Evaluation of reliability	.152	.071	.133	2.133	.034
	Creation of information	.052	.057	.056	.926	.355
	Social relationship using media	.021	.049	.022	.423	.673

a. Dependent Variable: Evaluation of the value of information

As shown in Table 5, the capability of evaluating the reliability of information obtained through media is closely related to the degree of using information. Information with reliability can be obtained by judging the value of the obtained information. This reliable information with value can be connected to people's informational and social activities. Thus the differences in the ability to evaluate the value of information can affect the intellectual digital divide.

## CONCLUSION

Media literacy refers to the capability of using media and information. Thus it can generate disparity in how to access, use, utilize, and evaluate information, which is connected to various types of digital divide. From this perspective, this research empirically verified whether media literacy effect on closing various digital divide.

Among the various factors of media literacy, accessibility to media affects all factors of digital divide. Media diversity affects all factors of digital divide except people's informational and social activities. This can be explained that access to media still affects the quantitative and qualitative digital divide.

In terms of public library use, the contribution of public libraries to social improvement has a positive effect on familiarity with media use, acquisition of information through media, and the degree to which information is utilized for informational and social activities. Based on these results, the use of public libraries has a positive effect on closing the quantitative, qualitative, and intellectual digital divide, generated by disparities in access to media, information acquisition through media, and evaluating the value and reliability of information obtained through media. In addition, through the use of smart devices, people acquire more information, which leads to the facilitation of people's social and information activities.

As a result, it is necessary for public libraries to provide media literacy services to play a role in closing quantitative, qualitative, intellectual, and smart divide, which are currently emerging as social problems. As a social and informational institution, public library needs to consider how to provide media literacy service and to allow people to enhance media literacy to fully access and utilize the value of information in the current information environment.

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# A Bibliometric Analysis of Netflix, Prime Video, and Hotstar: Research Trends, Impacts, and Future Directions in Online Streaming Platforms

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## ABSTRACT

The growth of top-three major OTT platforms: Netflix, Prime Video, and Hotstar, has drastically reshaped digital media consumption, inciting widespread academic interest. This study presents a bibliometric analysis of research concerning these top-three major OTT platforms by employing the Scopus database in order to spotlight key trends and future research directions. We congregated publications that referenced these platforms, including related terms such as "online streaming," "video on demand," and "over-the-top," by searching within titles, abstracts, and keywords. Subsequently, using the bibliometric analysis, we revealed that, among the top-three major OTT platforms, each of which has significantly influenced online streaming research, Netflix is of the utmost importance. The study also underscored a consistent upward trend in platform-focused research, validating their escalating influence in the digital media industry. Most of these studies centered on consumer behavior, with fewer exploring innovation and development, highlighting a research gap. We additionally traced the evolution of major themes from 2007 to 2023, revealing three stages of development. The early stage set the foundation, the second stage during the COVID-19 pandemic period intensified platform-specific studies, and the latest stage witnessed a surge in publications, especially concerning Netflix, video-on-demand, and media. Our study offers vital insights into the evolving research landscape on major OTT platforms, pinpointing key trends and highlighting unexplored areas.

**Keywords:** Bibliometric analysis, Streaming, Video on demand, Over-the-top, Information behavior

## INTRODUCTION

The rise of online streaming platforms has reshaped the landscape of the global entertainment industry, marking a pivotal shift in media consumption patterns. Streaming services such as Netflix, Prime Video, and Hotstar have been at the forefront of this digital revolution, offering a diverse array of content, from movies and series to documentaries and reality shows, accessible to viewers at their convenience (Cowton, 2023). This surge in the popularity of streaming platforms has intrigued scholars across the globe (Lotz, 2022; Singh, Arora, & Kapur, 2022), leading to a significant growth in research focused on understanding their impacts and future trajectories. The purpose of this study is to conduct a

bibliometric analysis focusing on the body of research pertinent to these influential online streaming platforms - Netflix, Prime Video, and Disney+ Hotstar, over a period of sixteen years (2007–2023). This is because bibliometric analysis, which uses quantitative analysis of academic literature to provide insights into trends, relationships, and gaps in current knowledge, is, thus, an appropriate and effective method for analyzing the evolution and trends in an area of study (Aria & Cuccurullo, 2017).

The platforms in focus – Netflix, Prime Video, and Hotstar – represent different models and geographic penetrations within the industry. Netflix, as a global pioneer of streaming services, has set many of the industry norms. Prime Video, a part of the vast Amazon ecosystem, has leveraged its parent company's capabilities to strengthen its market position. Hotstar, now known as Disney+ Hotstar, has seen significant success in the emerging markets, particularly in India, and is an example of a platform with a more regional focus (Cowton, 2023). This study endeavours to shed light on prominent research trajectories about these platforms, highlight under-explored areas of study and envision the future evolution of this swiftly advancing domain. In tracing the thematic evolution from 2007 to 2023, our study not only elucidates transforming research priorities but also anticipates future trends. Our findings are of considerable value to researchers, practitioners, and stakeholders aiming to comprehend the progress and influence of online streaming platforms in a rapidly evolving digital media landscape.

## **LITERATURE REVIEW**

### **Online Streaming Platforms and Over-the-top (OTT) media services**

Netflix, Amazon Prime Video, and Disney+ Hotstar are among the leading online streaming platforms globally, each with a unique journey that has shaped their current presence in the entertainment industry (Cowton, 2023). They have significantly transformed the way audiences consume media, pivoting from traditional modes of distribution to innovative, internet-based platforms, also known as Over-The-Top (OTT) platforms (Khurana & Metha, 2022). Netflix, founded in 1997, started as a DVD-by-mail service and gradually transitioned to a subscription model. The key transformative milestone was in 2007 when it introduced its streaming service, marking a new era in entertainment consumption. Around the same time, Amazon was crafting its own path in the online streaming arena. What started as Amazon Unbox in 2006 evolved into Amazon Prime Video by 2011, offering unlimited streaming of selected films and TV shows to Amazon Prime subscribers. Both Netflix and Prime Video later ventured into original content production, a strategic move that has significantly enriched their content libraries and established their global presence (Bloom, 2021; Netflix, 2023). On the other side of the world, in 2015, Star India launched Hotstar, leveraging India's cricket frenzy to gain significant initial traction. Unlike its western counterparts, Hotstar focused on a mobile-first approach in recognition of India's smartphone boom. Following Disney's acquisition of 21st Century Fox, Hotstar was rebranded as Disney+ Hotstar in 2020, integrating Disney's vast content library (Disney.com, 2022).

Indeed, focusing on Netflix, Prime Video, and Disney+ Hotstar is appropriate for this study as these platforms have a significant global presence and a vast array of international content. They provide a mix of local and foreign films, TV shows, documentaries, and original productions, catering to a diverse, worldwide audience (Lobato, Douglas, Scarlata, & Cunningham, 2023; Panda, Satpathy, & Sharma, 2021). Their content libraries encompass a wide range of languages and genres, thereby capturing the complexities and variety of global media. Furthermore, their ability to cater to different cultural contexts while navigating the intricacies of global content distribution makes them ideal subjects for a comprehensive study on online streaming platforms. The analysis of these three platforms will shed light on global media trends, audience preferences, and the transformative role of OTT platforms in the international entertainment industry.



## METHODOLOGY

We build our research methodology upon the pioneering work of both Naranjo & Fernández-Ramírez (2022) and Singh, Arora, & Kapur (2022), who utilized bibliometric analysis to explore the academic interest in Netflix and OTT domains, respectively. Naranjo & Fernández-Ramírez's work (2022) notably analyzed Netflix-related studies indexed in the Web of Science, considering elements such as authorship, affiliations, languages, journals, keywords, publication year, and received citations. Their study also conducted a thorough quantitative analysis of abstracts and papers to identify prevalent methodologies, themes, and samples. Singh, Arora, & Kapur (2022) took a slightly different approach by merging Scopus and Web of Science-indexed publications to examine trends in OTT research. Their findings indicated a growing acceptance of OTT as a research theme, yet also underlined the relative scarcity of studies on the subject, and the technological bias in existing research, highlighting a wealth of opportunities for future exploration. However, their efforts focused almost exclusively on Netflix-related studies, while streaming services like Prime Video and Disney+ Hotstar were utterly disregarded.

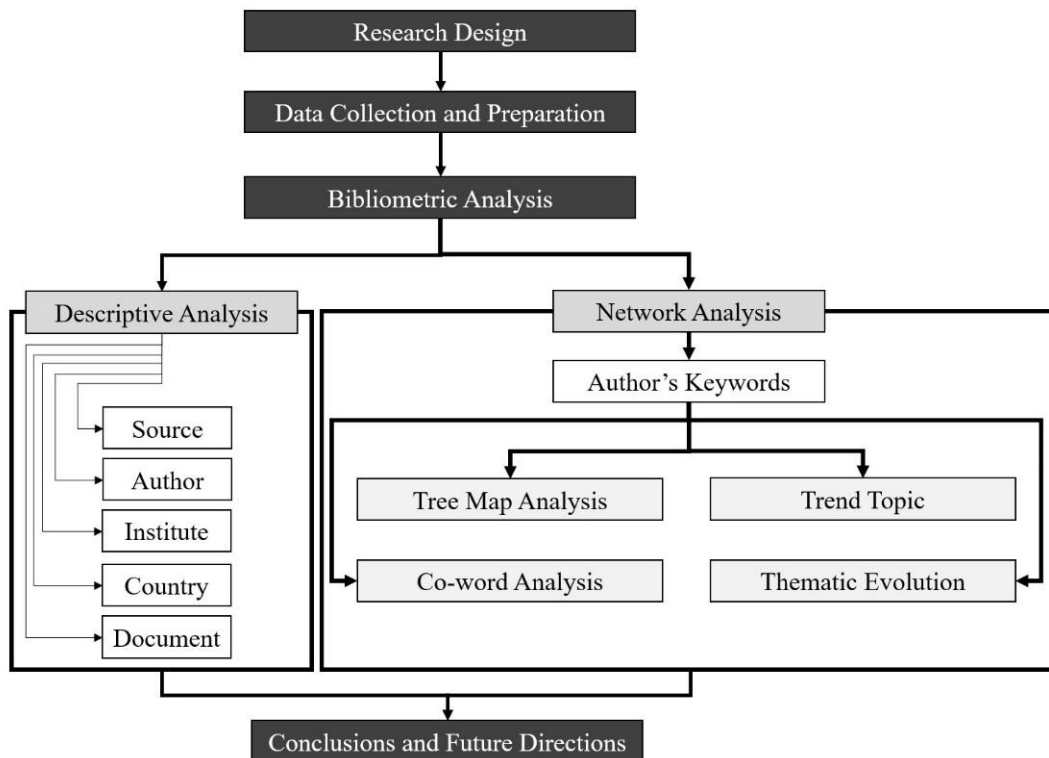
Considering this, in this study, we used a bibliometric approach to analyze the research trends, impacts, and future orientations of the top-three major OTT platforms: Netflix, Prime Video, and Disney+ Hotstar. Bibliometric analysis, the statistical analysis of vast volumes of bibliographic data, was a valuable instrument for evaluating the progression and emphasis of academic research. From the Figure 1, data collection was conducted through a search of the Scopus database for the top-three OTT platform-related keywords until June 3, 2023. The Scopus database was chosen as a bibliographic database resource due to its comprehensive coverage of diverse research fields. Consequently, we concentrated on the following research questions:

- 1) What is the status of the research on the top-three major OTT platforms?
- 2) What is the period-by-period development pattern of the top-three major OTT platforms, including Netflix, Prime Video, and Disney+ Hotstar, regarding the authors' keywords?
- 3) What are the most crucial research trends in the top-three major OTT platforms?

To answer these research questions, a systematic Boolean search operation was adopted to acquire the data for the bibliometric study from the Scopus database. The search was created to provide materials that closely matched our study interests in online streaming services like "Netflix," "Prime Video," "Hotstar," and "Disney+ Hotstar" as well as the related terms including "online streaming," "video on demand," or "over-the-top." Consequently, the Boolean operation was: (TITLE-ABS-KEY (("Netflix" OR "Prime Video" OR "Hotstar" OR "Disney+ Hotstar"))) AND ("online streaming" OR "over-the-top" OR "video streaming" OR "on demand") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "bk") OR LIMIT-TO (DOCTYPE, "re")) AND (LIMIT-TO (LANGUAGE, "English")). This operation aimed at retrieving any articles, conference papers, book chapters, books, and reviews (indicated by "ar," "cp," "ch," "bk," and "re," respectively) written in English that mentioned "Netflix," "Prime Video," "Hotstar," or "Disney+ Hotstar" in their title, abstract, or keywords. In addition, these documents also needed to contain key phrases related to the broader theme of online streaming platforms, such as "online streaming," "over-the-top," "video streaming," or "video on demand."

For data preparation process, we conducted a data pre-processing involving essential steps such as the removal of duplicates and irrelevant entries, data cleaning and normalization, particularly for author names and affiliations, journal names, and keywords. Subsequently, to reveal the answer to our research questions, a descriptive analysis was done together with mapping to visualize the data. Then, we followed this process with deeper exploratory and inferential analysis to glean insights about the research trends, impacts, and potential future directions in the study of these platforms. The Bibliometrix R-package was applied for the analytical section to carry out bibliometric analysis in

conjunction with visualization and science mapping analysis. Besides, bibliometric analysis techniques were performed, consisting of descriptive analysis of citation data and network analysis of the authors' keywords, including tree map, trend topic, co-word, and thematic evolution.



**Fig. 1. Research Framework**

## RESULTS AND DISCUSSION

### Bibliometric Descriptive Analysis

To understand the current of research status, the established Boolean operation for data retrieval on Scopus has facilitated a comprehensive bibliometric analysis of the academic landscape concerning online streaming services. It primarily focuses on the top-three major OTT platforms like Netflix, Prime Video, and Disney+ Hotstar, spanning 2007 to 2023 (Table 1). In this time frame, 679 scholarly documents have been sourced from 452 distinct platforms, encompassing a variety of formats such as books, journals, and conference papers. Indeed, the increase in scholarly discourse and investigation revolving around online streaming platforms such as Netflix, Prime Video, and Disney+ Hotstar is reflective of their escalating influence on global media consumption (Figure 2). This growth in academic interest, underpinned by the significant 27.86% annual growth rate, forecasts a future rich with further explorations, insights, and comprehension of the profound effects these digital media platforms exert on diverse aspects of society.

Content analysis of these documents reveals a plethora of keyword entries, with 1,878 occurrences under author's keywords and 2,500 under Keywords Plus, which are additional terms extracted from an article's references, interpreted by the Bibliometrix software (Aria & Cuccurullo, 2017). Such an extensive dataset aids in pinpointing prevailing themes and mapping the evolving research trajectories within this domain. Documents hold an average age of 3.88 years, suggesting an emerging yet rapidly expanding field of study. An average of 13.22 citations per document implies a substantial academic impact, indicating wide acceptance within the research community. With a total

of 31,923 references, the dataset promises a wealth of information and insights for conducting a robust bibliometric survey.

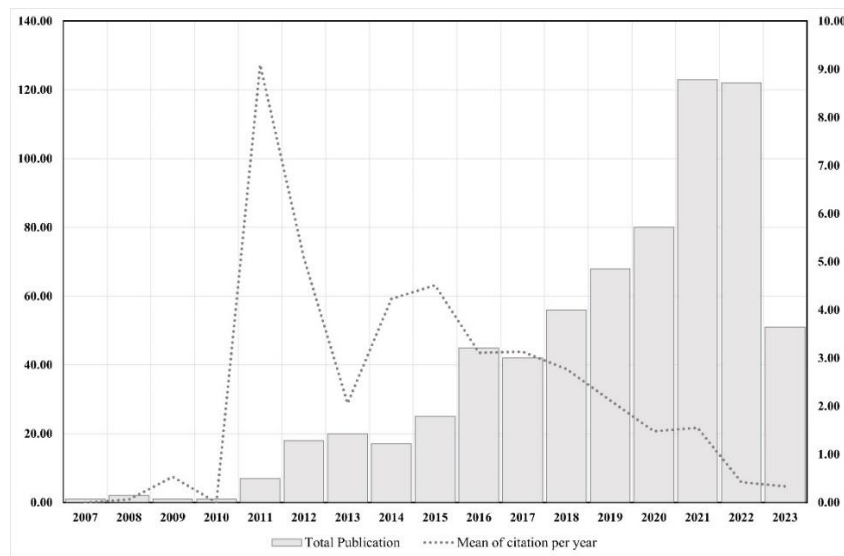
Based on the bibliometric analysis, it is evident that the field of online streaming platforms, specifically Netflix, Prime Video, and Disney+ Hotstar, has an active and diverse scholarly community, as demonstrated by the 1,522 authors who have contributed to the discourse. Of these authors, 159 have published single-authored works, suggesting that a significant majority of the research is being conducted in a collaborative manner, which can foster diverse perspectives, interdisciplinary approaches, and comprehensive insights. The high average number of co-authors per documents, 2.71, indicates a flourishing ecosystem of intellectual collaboration and exchange. The fact that nearly 17 percent of the collaborations are international demonstrates these platforms' global reach and universal appeal, highlighting the pervasive interest in studying online streaming services in diverse cultural and geographical contexts. This confirmed that the academic community's keen interest in these platforms is further reflected in Jin (2019)'s exploration of the globalization of digital media, which emphasizes the growing influence of platforms such as Netflix in shaping global processes. It reinforces our study's observation that these digital platforms are emerging as crucial sites of scholarly investigation, further extending our understanding of their role in the contemporary media landscape. This convergence of global perspectives substantiates our research's focus on the pervasive influence of these platforms, revealing their global impact and contribution to the evolving discourse of digital media and entertainment.

These results provide an enriched understanding of the digital media sector, underscoring the substantial impact of online streaming services and their wide-reaching implications on the global media environment. Indeed, this extensive data collection and analysis paves the way for identifying prevalent themes, prospective research voids, and evolving trajectories in online streaming platform-related academic inquiry. In addition, the remarkable annual growth rate, and the average number of citations per document demonstrate the increasing academic interest and substantial scholarly impact in this field of study. This increase in research activity, which has occurred primarily in the last four years, demonstrates the contemporary relevance of this discipline, its accelerated evolution, and its potential for further study. Our comprehensive analysis not only reaffirms the findings of Naranjo & Fernández-Ramírez (2022) and Singh, Arora, & Kapur (2022) but also significantly expands upon their research by incorporating an extensive selection of online streaming platforms and a more extended temporal scope. This more inclusive approach allows us to map the evolving academic landscape of online streaming research more accurately, providing a more nuanced understanding of its development, prominent themes, and future directions.

**Table 1. Descriptive analysis of documents on the top-three OTT platforms**

Description	Results
Timespan	2007:2023
Sources (journals, books, etc.)	452
Documents	679
Average citations per documents	13.22
References	31,923
Keywords Plus (ID)	2,500
Author's Keywords (DE)	1,878
Authors	1,522
Authors of single-authored documents	159
Authors of multiple-authored documents	1,363
Single-authored documents	179

Co-Authors per documents	2.71
Percentage of International co-authorships	16.94



**Fig. 2. Annual production and citations of publications documents on the top-three major OTT platforms**

### Bibliometric Network Analysis

Based on “authors’ keywords,” a tree of the 50 most frequently used terms in the research on the top-three major OTT platforms was shown in Figure 3. A larger rectangular area represents a larger proportion of a particular term. Netflix, streaming, video streaming, SVOD (acronym for “subscription video-on-demand”), and OTT (for “over-the-top”) are the five most prominent terms.



**Fig. 3. A keyword tree containing the 50 most frequently used terms for researching the top-three major OTT platforms**

Using the Bibliometrix software, research fronts of the top-three major OTT platforms are divided into two main clusters by co-words analysis on the author's keywords and displayed in the co-occurrence network in Figure 4. The co-word clusters are as follows:

Cluster 1 (Blue): OTT platform operations and context cluster consisted of keywords as follows: Netflix, streaming video, streaming television, SVOD (subscription video-on-demand) and OTT (over-the-top), VOD (video on demand), YouTube, and Covid-19

Cluster 2 (Red): streaming technology and user experience cluster consisted of keywords as follows: quality of experience (QoE) and dynamic adaptive streaming over HTTP (DASH)

The cluster 1 encapsulates the operational aspects of OTT platforms and the broader societal context in which they function. these keywords can be breakdown into five main concepts represented by the keywords in this cluster as follows:

1. Sub-cluster 1.1: Netflix, OTT, VOD - these terms represent specific types of online streaming platforms. Netflix is a particular service, OTT (over-the-top) is a broad term for services that deliver content over the internet, and VOD (video-on-demand) refers to services that allow users to select and watch video content when they choose to, rather than at a specific broadcast time.
2. Sub-cluster 1.2: streaming, video streaming - these terms are about the process of transmitting or receiving data (especially video or audio material) over a computer network as a steady, continuous flow, allowing playback to proceed while subsequent data is being received.
3. Sub-cluster 1.3: television, SVOD (subscription video-on-demand) - these terms highlight the shift from traditional broadcast television to subscription-based streaming models where viewers can access an unlimited amount of content for a monthly fee.
4. Sub-cluster 1.4: YouTube - this term represents a specific platform that started as a user-generated video sharing site and has evolved into a significant player in the OTT and VOD landscape.
5. Sub-cluster 1.5: COVID-19 - this term indicates the wider societal context in which these platforms operate. The COVID-19 pandemic had a significant impact on media consumption patterns, with many people turning to streaming platforms while in lockdown.

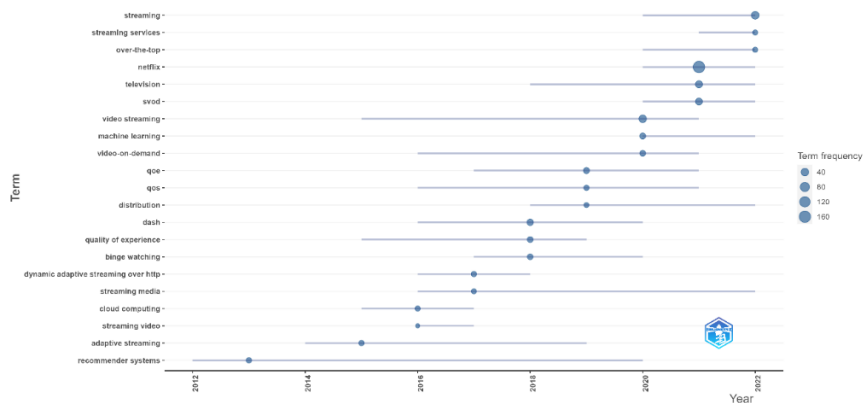
Whereas for the cluster 2, the "streaming technology and user experience" cluster is centered on the intersection of technology and user experience in the context of video streaming services. It examines how technology enhances user experience and how the user's perception can, in turn, drive technological advancements in this field. It can be also breakdown into two main concepts represented by the keywords in this cluster as follows:

1. Sub-cluster 2.1: quality of experience (QoE) - this term represents the subjective measure of a customer's experiences with a service (in this case, a streaming service). It is often used to understand users' satisfaction levels and their perceived quality of the service.
2. Sub-cluster 2.2: dynamic adaptive streaming over HTTP (DASH) - this is a technical term representing an adaptive bitrate streaming technique that enables high-quality streaming of media content over the internet. It works by adjusting the quality of a video stream in real-time according to network conditions, thus optimizing each user's viewing experience.

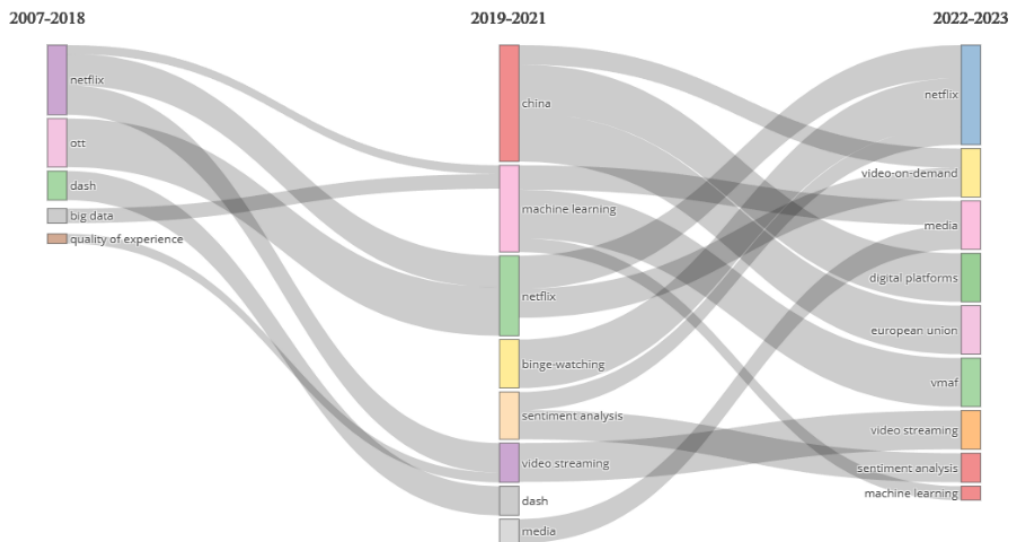


**Fig. 4. Co-words analysis on the author’s keywords**

From Figure 5, a trend analysis on specific topics or keywords have been performed related to online streaming and technology. We have analyzed their frequency of occurrence in academic literature. We found that, in the cluster 1 of keywords such as Netflix, streaming, and television, the trend seems to show that the topic of "Netflix" has the highest frequency (168), beginning in 2020 and last appearing in 2022. This shows that "Netflix" has been a prominent research topic in recent years. Whereas other keywords in this cluster such as streaming, television, and SVOD have also shown a trend towards an increasing number of publications in recent years, signifying growing interest in these research areas. On the other hand, in the cluster 2 of keywords (such as QoE and DASH), the trend seems to suggest that these topics have been prevalent for a slightly longer period (from around 2015-2016) but might be less frequently discussed in recent years (2020-2022). This could suggest that these topics have been foundational to the field of research, but it may be seeing a slight decrease in focus, potentially making way for new emerging topics. Furthermore, our analyses have shown the evolution of research focus in the field of online streaming platforms over the years, which could be crucial for understanding the development of this field which could be used to determine its future directions (Figure 6). This underscores an upward trend in the quantity of articles concerning the top-three major OTT platforms, with the discourse progressively maturing, specifically in the realm of streaming services, with Netflix being a focal point.



**Fig. 5. Trend of research topic for the sunrise topic in the top-three major OTT platforms**



**Fig. 6. Temporal progression of keyword utilization in the research pertaining to the top-three major OTT platforms**

## CONCLUSION

This study examined the top three-major OTT platforms, including Netflix, Prime Video, and Disney+ Hotstar, for their past trajectory, growth patterns, and noteworthy developments. The noticeable scholarly attention presented to these OTT platforms, especially Netflix, revealed a heightened scholarly interest. Our research suggested three distinct phases in developing the research related to these OTT platforms: the foundation-building phase, which lasted from 2007 to 2018; the pandemic-affected period, which lasted from 2019 to 2021; and the ongoing phase, which began in 2022. In addition, we looked at the expanding importance of OTT platforms in the digital media sector. It was found that three major study themes are "Netflix," "streaming," and "Video-On-Demand (VOD)," highlighting their importance to the industry as a whole. Our analysis also revealed new topics for research, including user experience, OTT platform operations and context, user behavior, and streaming technologies.

In summary, this bibliometric analysis can show the research landscape of these OTT platforms, which provides a thorough perspective. Our research findings underlined the development and emerging patterns that show the platforms' expanding significance in the media sector and their ability to shape future research trajectories. Additionally, each of the three distinct stages of research progression was focused and trended, marking each of the three stages of research evolution, reflecting the dynamic nature of this field. Significant study fields have evolved in streaming technologies, user experience, OTT platform operations and context, and user behavior. Because we were primarily interested in English literature and the top three main OTT platforms, we were aware of the limits of our research. In future studies, we will consider related studies published in other languages, such as Spanish, French, Chinese, or Thai. Despite these limitations, our findings offer valuable insights into the research landscape of the top three major OTT platforms, potentially informing future research directions.

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# Enhancing Accessibility and Navigability in the Thai Encyclopedia: A Systematic Approach to Constructing Informative Short Descriptions

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## ABSTRACT

This research paper presents a methodology for addressing the issue of missing short descriptions in the Thai Encyclopedia and explores their integration into LSTPedia, the Thai-language encyclopedia. Through a comprehensive literature review, we highlight the significance of short descriptions in improving search engine performance and enhancing user experience. By collecting and analyzing diverse articles from the Thai Encyclopedia, we develop a methodology that utilizes natural language processing techniques to automatically generate concise and informative short descriptions. We also investigate integration strategies for LSTPedia, including user interface design, metadata integration, and content organization, aiming to improve user accessibility and comprehension. Experimental results demonstrate the functionality of our methodology, while revealing challenges related to the availability of Thai-language datasets and the accuracy of generated content in Thai. Future research is needed to address these challenges and optimize short description generation in the Thai language, enhancing the usability of knowledge repositories. This paper provides valuable insights into addressing the issue of missing short descriptions in the Thai Encyclopedia and offers guidance for effectively integrating them into LSTPedia, ultimately improving user accessibility and comprehension.

**Keywords:** Short Description, Thai Encyclopedia, Wikidata, Semantic Technology

## INTRODUCTION

In today's digital age, the evolution of the World Wide Web has transformed the way we access and interact with information. The transition from Web 1.0 to Web 2.0 and now Web 3.0 has brought about significant changes in how we create, share, and consume content.

The advent of Web 1.0 introduced static web pages that primarily served as information sources. Users could browse these pages, but interaction and content contribution were limited. However, with the emergence of Web 2.0, the internet became a platform for collaboration, user-generated content, and social networking. This shift allowed users to actively participate in content creation, leading to the rise of platforms such as social media, blogs, and wikis.

Speaking of wikis, Wikipedia stands out as one of the most prominent examples of Web 2.0 platforms. It has revolutionized knowledge sharing by enabling users from around the world to collaboratively create and edit articles on various subjects. However, the Thai version of Wikipedia faces a significant challenge when it comes to implementing short descriptions in its articles.

Short descriptions play a crucial role in providing concise summaries of articles, facilitating quick understanding, and enhancing search engine optimization (SEO). However, our analysis of a representative sample of articles from the Thai Wikipedia revealed a significant deficiency in short descriptions, with an estimated figure of approximately 85.26% of the total articles lacking them, amounting to around 135,665 articles as of June 2023.

The manual creation of short descriptions by human editors poses challenges, given the vast volume of articles, leading to debates on their necessity and feasibility. Addressing this issue is crucial for improving user experience and optimizing SEO in the Thai Wikipedia context. By shedding light on these self-discovered statistics and emphasizing the importance of short descriptions, our research contributes to a better understanding of the current state and the need for improvement in this aspect of Thai Wikipedia.

This paper aims to address the aforementioned problem by presenting a construction methodology for short descriptions to enhance the organization and understanding of article content. By providing a systematic approach, we intend to classify similar topics and identify context boundaries within the Thai Encyclopedia. This classification of topics and identification of context boundaries will contribute to the creation of concise yet informative summaries of article content, improving the overall accessibility and navigability of the Thai Encyclopedia.

The remainder of this article is organized as follows. Section II provides a comprehensive review of web technology and related works, establishing the background for our research. In Section III, we present our research methodology, outlining the approach employed in our study. Section IV presents the results of our research and provides a detailed discussion of the findings. Finally, in Section V, we conclude this work by summarizing the key insights and contributions of our study.

## **LITERATURE REVIEW**

The literature review section examines the construction and significance of short descriptions in enhancing search engine performance and establishing context boundaries within the Thai Encyclopedia. Despite their importance, a significant number of articles in the Thai Wikipedia lack short descriptions, impacting user accessibility and comprehension. This section explores relevant research and proposes a methodology for creating short descriptions using multiple factors available from the content itself. The findings contribute to improving the organization and navigability of the Thai Encyclopedia.

### **Web Technology**

Web technology has undergone significant transformations, shaping the way we interact with online information. The evolution can be traced through the stages of Web 1.0, Web 2.0, and Web 3.0. Web 1.0, characterized by content delivery networks (CDNs) and static websites, primarily offered a read-only experience, where information was displayed without significant user interaction. (Aghaei, 2012;

Fuchs et al., 2010) During this phase, data lacked focus and was not personalized to individual users. However, with the advent of Web 2.0, a paradigm shift occurred. Websites became platforms for user-generated content, emphasizing usability and interoperability (Fuchs et al., 2010). Users gained the ability to actively contribute to the web, resulting in a read-write experience and the introduction of web applications. The subsequent progression to Web 3.0 revolutionized web utilization, transforming it into a database-driven environment. Web 3.0 brought about personalized and intelligent web-based functions and applications, offering portable and personalized experiences for users.

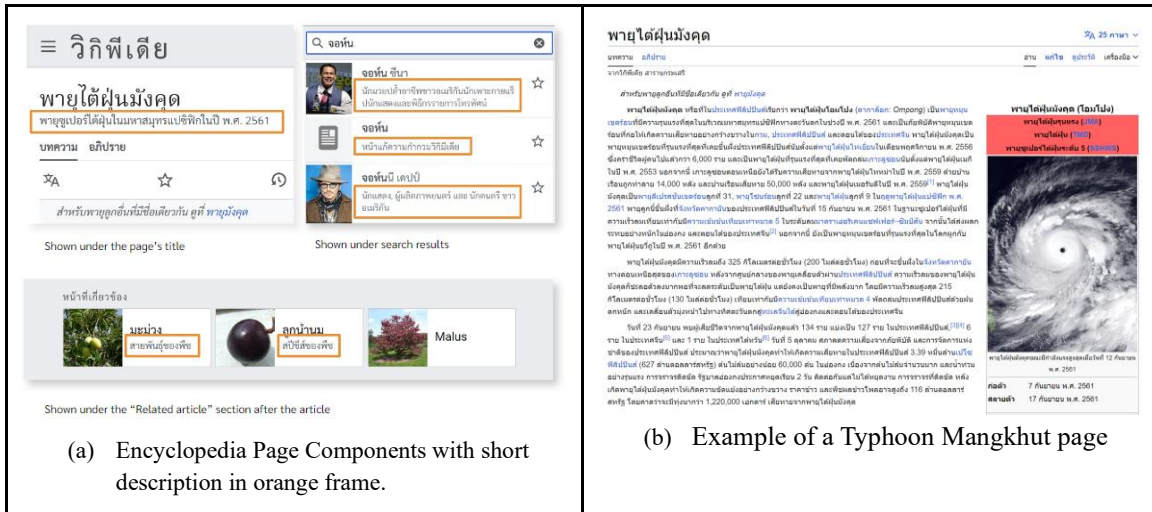
The issue at hand revolves around the implementation of short descriptions within the Thai Wikipedia. Short descriptions are considered a best practice in the context of Wikipedia, as they provide concise summaries of articles and play a vital role in enhancing user experience. By offering a brief overview of the content, short descriptions provide users with valuable context and aid in distinguishing each search result. They enable users to quickly assess the relevance and significance of an article, thereby streamlining the information retrieval process. However, after conducting a comprehensive examination of the Thai Wikipedia, it has been found that a significant proportion of articles lack short descriptions, estimated at approximately 85.26% of the total number of articles that should ideally have them. This finding is based on a thorough analysis conducted as part of this research, highlighting the urgent need for addressing the deficiency in short descriptions. The absence of short descriptions not only hampers the accessibility and comprehensibility of the content but also poses challenges in terms of manual creation by human editors, as it is a labor-intensive and often deemed unnecessary task (Vrandečić, 2021).

In Thai Wikipedia, short descriptions are commonly displayed under the article title, in search results, and in the related article section, as depicted in Figure 1(a). These short descriptions are primarily visible on the mobile version of Wikipedia. Encyclopedic pages typically comprise three components, each serving specific functions:

1. *Short Description under Article Title:* This component provides a concise overview of the article being read, aiding readers in obtaining a brief understanding of its content.
2. *Short Description in Search Results:* The short description appears below the article title in search results, enhancing the search experience by offering additional context for each search result.
3. *Short Description in Related Article Section:* Located at the bottom of the article, this component provides more information than the article title alone in the related article section. It assists readers in determining which article to read next, facilitating navigation within the encyclopedia.

For instance, on the Typhoon Mangkhut page (as illustrated in Figure 1 (b)), the content in Thai describes the typhoon as follows: "Typhoon Mangkhut (Thai pronunciation: [māj.k<sup>h</sup>út]), known in the Philippines as Typhoon Ompong, was a powerful and catastrophic tropical cyclone that caused extensive damage in Guam, the Philippines, and South China in September 2018." This content is condensed into a concise text known as the short description: "Super Typhoons in the Pacific Ocean in 2019", which serves the aforementioned purposes.

The presence and significance of short descriptions in Thai Wikipedia, particularly in terms of improving user navigation, search results, and article comprehension, warrant further investigation. Thus, this literature review aims to analyze existing research and literature pertaining to short description generation and its impact on user experience and search engine performance. By examining the established practices by Wikipedia and evaluating the deficiency of short descriptions within the Thai Encyclopedia, specifically the Language and Semantic Technology Encyclopedia (LSTPedia), this study proposes an effective methodology to address this issue.



**Fig. 1. Components of Encyclopedia (LSTPedia)**  
<https://aimht.lstpedia.org/about/wiki/detail/118>

**Related Works**

To gain insights into the construction and significance of short descriptions, we conducted a comprehensive literature review, examining existing research on short description generation and its impact on search engine performance and user experience. We analyzed the best practices established by Wikipedia and identified the deficiency of short descriptions in a significant number of articles within the Thai Encyclopedia, named *Language and Semantic Technology Encyclopedia (LSTPedia)*<sup>1</sup>. This analysis served as a basis for proposing an effective methodology.

In the field of generating short descriptions for Wikipedia articles, two notable papers have made significant contributions. "WikiDes: A Wikipedia-based dataset for generating short descriptions from paragraphs" (Ta et al., 2023) focuses on creating a dataset called WikiDes, which consists of over 80k English samples covering a wide range of topics. The authors propose a two-phase summarization method using transfer and contrastive learning techniques. They demonstrate the superiority of models like T5 and BART for description generation and showcase the effectiveness of metric fusion-based ranking models. By automating the process of generating descriptions, WikiDes reduces the human effort required and enriches Wikidata-based knowledge graphs.

**Table 1. A Comparison of Related Work on Thai WikiData**

Comparison	Paper 1	Paper 2
Related Works	WikiDes: A Wikipedia-based dataset for generating short descriptions from paragraphs	Descartes: Generating Short Descriptions of Wikipedia Articles
Language	Monolingual	Mono & Multilingual
Methodology	Two-phase summarization method using transfer and contrastive learning	Integration of article text, existing descriptions, and

<sup>1</sup> Language and Semantic Technology Encyclopedia, <https://aimht.lstpedia.org/>

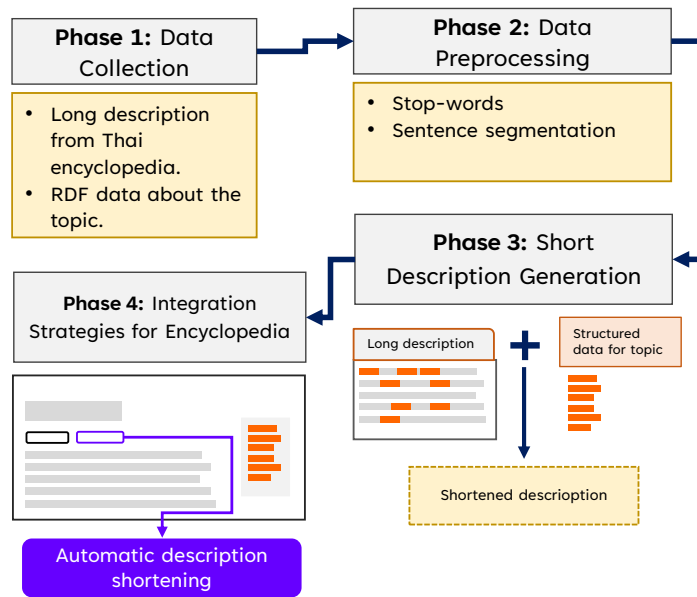
		semantic type information from a knowledge graph
<b>Dataset Size</b>	Over 80k English samples on 6,987 topics	Not mentioned
<b>Performance</b>	Achieved up to 22 ROUGE scores in topic-exclusive and topic-independent splits	Comparable to human-written descriptions, high percentage passing inclusion bar for Wikipedia
<b>Availability</b>	Available at: <a href="https://github.com/declare-lab/WikiDes">https://github.com/declare-lab/WikiDes</a>	Not mentioned
<b>Citations</b>	(Ta et al., 2023)	(Sakota et al., 2022)

In a similar vein, "Descartes: Generating Short Descriptions of Wikipedia Articles" (Sakota et al., 2022) addresses the problem of missing short descriptions in Wikipedia articles across multiple languages. The authors introduce Descartes, a multilingual model that integrates information from the article's text, existing descriptions in other languages, and semantic type information from a knowledge graph. Descartes surpasses baseline approaches and performs comparably to human-written descriptions. The model shows promise in supporting human editors by providing accurate and informative descriptions for a wide range of Wikipedia articles.

These papers provide valuable insights and methodologies that can be applied to the development of LSTPedia, a Thai-language encyclopedia. By adopting the approaches presented in WikiDes and Descartes, the generation of short descriptions for Thai Wikipedia articles can be automated, improving the user experience and filling the gap of missing descriptions in Thai-language Wikipedia. The integration of these techniques will enhance the accessibility and usability of LSTPedia, contributing to the advancement of knowledge dissemination in the Thai language.

## METHODOLOGY

Considering the time limitations, our proposed methodology aims to provide a foundational understanding of how to address the issue of missing short descriptions in the Thai Encyclopedia, while also exploring potential integration strategies for LSTPedia, the Thai-language encyclopedia, in the future. The following section outlines the key steps involved in our approach and highlights their significance in improving user accessibility and comprehension.



**Fig. 1. A working pipeline of a Wikidata shortening system**

### **Phase 1: Data Collection and Preparation**

To develop a comprehensive understanding of LSTPedia's content, we collected and processed a data from the Thai Encyclopedia in cultural domain. The collected dataset formed the basis for subsequent steps in our methodology.

### **Phase 2: Data Preprocessing**

Multiple approach for pre-processing the collected data is used including sentence segmentation and removal of stop-words.

### **Phase 3: Short Description Generation**

Building upon the collected dataset, we devised a methodology for generating short descriptions by leveraging multiple factors available from the content itself. Drawing inspiration from the work of Ta et al. (2023) on "WikiDes: A Wikipedia-based dataset for generating short descriptions from paragraphs" and the methodology proposed in "Descartes: Generating Short Descriptions of Wikipedia Articles" by Sakota et al. (2022), we adopted a combination of techniques. These techniques involved utilizing existing short descriptions in other languages, ontology data from Wikidata, as well as the first sentence and first paragraph of the content. Natural language processing techniques were employed to automatically generate concise and informative short descriptions, aiming to streamline the creation process and reduce the burden on human editors. From these works, we have chosen to incorporate the approach presented in the work "WikiDes" by Sakota et al. (2022). Their study evaluated various models and identified that the BERT-base and T5-small models performed exceptionally well in generating short descriptions. We have adapted their approach to the context of the Thai language and evaluated their performance accordingly.

## Phase 4: Integration Strategies for Encyclopedia

Recognizing the importance of short descriptions in enhancing user accessibility and comprehension, we explored various integration strategies to incorporate the generated short descriptions into Thai Encyclopedia. These strategies encompassed considerations such as user interface design, metadata integration, and content organization, ensuring the seamless integration of short descriptions within the Thai-language encyclopedia. By implementing these integration strategies, we aimed to enhance the organization, navigability, and overall user experience of the Thai Encyclopedia.

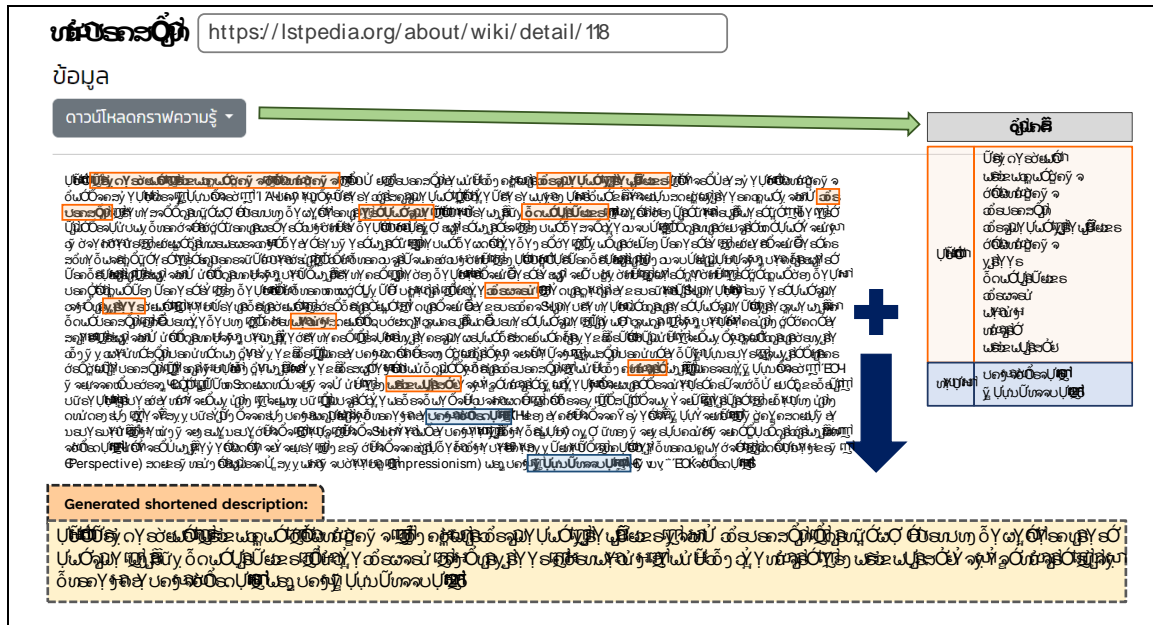


**Fig. 2. Language and Semantic Technology Encyclopedia (LSTPedia)**  
<https://lstpedia.org/about/wiki/detail/118>

By presenting our methodology, this paper offers valuable insights into addressing the issue of missing short descriptions within the Thai Encyclopedia. Additionally, our exploration of integration strategies provides guidance on effectively incorporating short descriptions into LSTPedia, ultimately improving its organization, navigability, and user experience. It is important to note that this research draws inspiration from the work of Ta et al. (2023) and Sakota et al. (2022) in terms of data collection and generation methods. However, further investigation and implementation are required to fully realize the benefits of short descriptions within LSTPedia and other Thai-language knowledge repositories.

## EXPERIMENTAL RESULT AND DISCUSSION

Using the methodology proposed in this academic paper, we conducted an experiment to showcase the functionality of our encyclopedia content shortener system in context of Thai cultural data, which will be further developed into a comprehensive short description generation approach. The goal of this experiment was to demonstrate the effectiveness of our method in producing shorter yet relevant content that captures the essential facts from the original full description. The results of the experiment are summarized in Table 1, which provides an excerpt illustrating the shortened content and its relevance to the topic under discussion.



**Fig. 3. Excerpt of an experiment Result in the encyclopedia content shortening system <https://lstpedia.org/about/wiki/detail/118>**

Upon analyzing the results of the experiment, it became evident that the availability of Thai-language datasets is significantly lower compared to English datasets. This discrepancy in dataset sizes raises concerns about the accuracy and reliability of the generated content in Thai. While the monolingual nature of WikiDes (Ta et al., 2023) might limit its applicability, relying solely on this method may not be ideal due to the scarcity of Thai data.

In contrast, the Descartes system (Sakota et al., 2022) utilized a comprehensive approach by incorporating ontology data, existing descriptions across languages, and the content within the articles. Descartes demonstrated success in supporting automation across multiple languages, leveraging models like T5 and mBERT, which exhibited promising performance across 25 languages as mentioned in the paper. However, it is important to note that the dataset collected for Descartes consisted of the first sentence in the first paragraph of each page. This poses a challenge for Thai language processing, as accurate sentence segmentation is still an ongoing concern.

Furthermore, in the context of the Thai language, several factors need to be considered. The study conducted by (Leenoi et al., 2022) extensively investigated the challenges associated with constructing the Thai WordNet through translation, highlighting the need for human review. These challenges encompass difficulties in direct translation, word compounding, word transferring, and phrase translation, all of which stem from the cultural disparities between languages and may require human intervention (Leenoi et al., 2008).



These findings shed light on the need for further exploration and development of suitable methods for short description generation in the context of the Thai language. While WikiDes provides valuable insights into monolingual approaches, the limitations of available Thai datasets must be considered. On the other hand, Descartes offers a more comprehensive and multilingual approach, but the challenge of accurate sentence segmentation in Thai remains. These observations highlight the importance of addressing these challenges to facilitate the automation of short description generation and improve the overall accessibility and usability of Thai-language knowledge repositories.

## CONCLUSION

In conclusion, this study introduces a methodology for generating short descriptions in Thai, demonstrating its potential. However, the accuracy of the generated content requires improvement, necessitating further research to optimize short description generation in the Thai language. It is important to acknowledge the limitations of the study, including the small sample size and the absence of evaluation regarding the impact of generated short descriptions on user experience. Future research should address these limitations to enhance the effectiveness of short descriptions in Thai-language knowledge repositories.

## ACKNOWLEDGEMENT

This paper is partially supported by the National Science and Technology Development Agency (NSTDA) under the Junior Science Talent Project (JSTP) short-term scholarship program. Secondly, the authors are immensely grateful for linked open data, Thai Wikidata are kindly provided by LSTPedia.org, Language and Semantic Technology Laboratory (LST), National Electronics and Computer Technology Center (NECTEC) that provided insight, necessary resources, and expertise that greatly assisted the research. Finally, the authors would like to show our gratitude to Princess Chulabhorn Science High School Buriram for providing the laboratory and necessary equipment.

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<https://doi.org/10.1145/3425778>

# **A Study on Essential Considerations for Introducing a System for Selecting Preservation Formats of Electronic Records -Focused on Audiovisual Records-**

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## **ABSTRACT**

In South Korea, the digital strategy for long-term preservation has been designed around electronic documents produced by public institutions, making it difficult to apply to other types of records other than electronic documents. Therefore, we analyze the preservation strategies of national archives of four countries (South Korea, the United Kingdom, the United States, and Australia) to derive essential considerations for building a selection strategy of preservation format through the case study about audiovisual records. The essential considerations we have derived can be applicable to national archives of all countries that aim to preserve electronic records in the long term. If the essential considerations are taken into account in the long-term preservation of electronic records, it would allow for flexible adaptation while minimizing risks, even in the face of changes in the records management environment or the introduction of new technologies.

**Keywords:** Electronic Records, Preservation Format, Long-term Preservation, Audiovisual Records

## **INTRODUCTION**

Today, the production environment and technology of electronic records are advanced and changing rapidly. Given the system-dependent nature of electronic records in this environment, it is important to keep them available for the long term. In particular, since electronic records are more volatile and unstable than paper records, it is essential to establish an appropriate long-term preservation strategy to preserve the original functional properties and bitstreams of electronic records.

For example, in South Korea, 『Public Records Management Act』 mandates the preservation of records. This law, which was enacted in 1998 and wholly amended in 2007, establishes an electronic production and management system for records so that records are reflected in the records management process from the production process. However, this system is only centered on records in the form of electronic documents. As an example of this, the National Archives of Korea has selected only PDF/A-1b format as the preservation format through the “Technical Specification for Preservation Format of Document-type Digital Records: PDF/A-1b based format” in 2008. This single preservation format system allowed for systematic management for long-term preservation of document types, but it was

difficult to systematically manage other types such as video, audio, and 3D graphics that are not targeted by the PDF/A-1b format.

For this reason, South Korea has established a system to select the appropriate format for preservation by type of electronic record for long-term preservation of such electronic records. Rather than simply presenting formats, the system is designed to select the appropriate format for preservation through common criteria applied to all electronic records and intrinsic criteria applied to each type of electronic record so that each archive can flexibly select the appropriate preservation format for each type of electronic record (Han et al., 2020). A format suitable for preservation is defined as a 'preservation format', which means a format that can be reproduced regardless of changes in time and technology by maintaining the main characteristics such as content and appearance of the electronic record at the time of production (NAK, 2022). In selecting such a preservation format, it is important to derive intrinsic criteria by considering the Significant Properties that vary by type of electronic record.

According to the 『Public Records Management Act』 of South Korea, audiovisual records are records that are legally prescribed for production obligations, and under the current law, they must be created electronically. Despite its importance, the public standard "NAK 37:2022 (v1.0) Selection Criteria for Preservation Format of Digital Records (v1.0)" described in the previous example does not yet provide intrinsic criteria for all types of electronic records, but only defines intrinsic criteria for document-type electronic records (text, presentation, and spreadsheet). As a result, it is difficult to select a preservation format for the management of audiovisual records based on these public standards.

In addition, the Korean public standard for the management of audiovisual records, "NAK 22:2009 (v2.0) Special Type Records Management Part 3: Audiovisual records (2.0)" does not describe audiovisual records in electronic form. The standard is limited to non-electronic records and does not provide details such as what format should be used for transferring and preserving audiovisual records in electronic form, although it does state that the transfer process is the same as for electronic records in general. Therefore, this study focuses on audiovisual archives from South Korea, the United Kingdom, the United States, and Australia to derive considerations for building such a selection strategy of preservation formats.

Despite the production and management obligations for different types of records set forth in the law, South Korea currently lacks specific guidelines for long-term preservation for all types of records. In particular, South Korea's overall digital preservation strategy is designed around public records, especially electronic documents that are often produced in the work environment. Due to these characteristics, it is difficult to incorporate other record types into the existing preservation strategy and apply them as they are, and it is also difficult to organize a new preservation strategy for those record types. From this perspective, the implications of this study are not only applicable to South Korea but should be proactively considered in building a preservation strategy involving a system for the selecting preservation formats of electronic records. Therefore, countries looking to adopt advanced records management technologies may be able to reduce this learning curve if they incorporate these considerations into the design phase of their preservation strategy.

## **INVESTIGATE PRESERVATION STRATEGY STATUS**

A strategy for selecting preservation formats of electronic records provides guidance on what file formats to convert to when archives adopt a migration strategy for long-term preservation. These guidelines can be linked to methods of format risk management because they involve investigating the stability of file formats. From this perspective, we selected South Korea, the United States, and Australia, which are adopting migration strategies that require the establishment of a system for selecting preservation format as a long-term preservation strategy, South Korea, which is building a

format risk management tool, and the United States and the United Kingdom, which have already systematically implemented such tools.

The study was based on information provided on the websites of the national archives of these four countries (South Korea, the United Kingdom, the United States, and Australia: the National Archives of Korea (NAK), The National Archives of the United Kingdom (TNA), the National Archives and Records Administration (NARA), and the National Archives of Australia (NAA).

By examining the current status of preservation strategies for long-term preservation in the national archives of four countries, we aimed to derive issues and implications that should be considered when organizing a preservation system. For this purpose, we focused on to analyze the current status of preservation format strategies and category organization of audiovisual records among the preservation strategies.

## 2.1 Status of Preservation Format Strategies

Preservation format strategies in four countries were examined and analyzed, focusing on preservation format conversion policies and format risk management methods. Table 1 below summarizes the current state of preservation format strategies in these four countries.

**Table 1. Status of preservation format strategies in four countries**

Countries	Features
South Korea (NAK)	Selection system for preservation format for long-term preservation of electronic records Present a selection system divided into common criteria and intrinsic criteria considering Significant Properties by type Assess file format risk with DFR using common and intrinsic criteria scores
United Kingdom (TNA)	Present the file format for transfer Manage format risk with DROID and PRONOM to ensure continuous access to digital information
United States (NARA)	Present a format risk selection system in a digital preservation strategy framework Added items to set retention priorities for the archives Suggest preservation actions after presenting Significant Properties for each category
Australia (NAA)	Present in preferred format Monitor risk by your own standards Manage risk with a focus on formats used by Australian organizations

In Table 1, the UK and Australia have selected specific formats for each type based on their own criteria, with the UK presenting formats as the file format for transfer and Australia presenting formats as preferred formats. South Korea and the US, on the other hand, provide a framework for selecting preservation formats. Like the UK and Australia, these schemes are based on their own criteria, but are designed to be flexible enough to allow archivists to score the criteria questions themselves and select the format that works best for their archives.

All four countries have, or are building their own format risk assessment systems. To ensure continued access to digital information, the UK has developed software called DROID and PRONOM that allows archivists to assess format risk on their own, enabling them to make agile and rapid decisions about selecting format. Australia has its own criteria for monitoring format risk, which focuses on formats used by Australian organizations. In particular, South Korea and the US are evaluating the risk

of file formats based on questions posed by the system for the selecting preservation formats. Both countries are linking systems for the selecting preservation formats and systems for risk assessment to help ensure effective risk management. Both countries are characterized by their incorporation of Significant Properties of records into their risk assessment systems. South Korea derives intrinsic criteria from Significant Properties and incorporates them into a scoring system. It is currently in the process of developing the Data Format Registry (DFR), a risk assessment system that includes this scoring system, for public service. Through the Action Plan, the United States identifies Significant Properties by category and proposes practical preservation measures. In particular, the US has added a separate section that allows archives to set their own preservation priorities, so that this scheme can be characterized for each archive.

## 2.2 Categories of audiovisual recordings

The hierarchical structure of records is largely composed of series, file, and item, but in electronic records, it is also divided into component hierarchies (Seol & Cheon, 2005). Digital component types are not fully interoperable, as each type of digital component has its own unique format. For example, for a component of type audio, the format used to reproduce a component of type text cannot fully reproduce the functionality of the original component. Due to the nature of these digital components, designing a categorization of digital components is a fundamental step in establishing a long-term preservation strategy for electronic records. From this perspective, the categories of audiovisual records in the national archives of the four countries are summarized and organized in Table 2. In this case, the audiovisual recordings were organized by selecting categories within the corresponding classifications in the UK, the US, and Australia based on South Korea.

**Table 2. Audiovisual records from four countries**

Category	South Korea (NAK)	United Kingdom (TNA)	United States (NARA)	Australia (NAA)
Image	Photography-film	Images	Digital Still Image	Digital still image
Audio	Recording-video	Audio	Digital Audio	Digital audio
Video		Videos	Moving Image: Digital Cinema	Digital cinema
			Moving Image: Digital Video	Digital video (Container)
			Digital Video	

As shown in Table 2, archives other than the National Archives of South Korea categorize audiovisual records into at least three types. In contrast, NAK in South Korea manages audiovisual records by classifying them into photography-film and recording-video. This is because the public standard for the management of audiovisual records, "NAK 22:2009 (v2.0) Special Type Records Management Part 3: Audiovisual records," only covers analog audiovisual records. However, it is not possible to design a preservation strategy for digital audiovisuals using the same categories as for analog audiovisuals because of the different ways in which components of recordings and videos are reproduced. This is because the recording (audio) format is to reproduce data in the form of sound, and the video format is to reproduce data in the form of video at the same time as sound, so they cannot use the same format. Therefore, it is necessary to subdivide the audiovisual recordings category.

In the UK, there is no need to provide detailed guidance on preservation formats for each type, as the principle is that formats are transferred as they were produced. Therefore, the UK divides audiovisual recordings into minimal categories based on differences in the way components are reproduced.

In particular, in the case of Australia (NAA), video is managed even down to the container. The peculiarity of the categories in the two national archives is that they categorize the two types of components despite the fact that they are represented in the same way. This categorization is based on the fact that each type of Significant Property is different from a recordkeeping perspective.

## **IMPLICATIONS**

This study suggests the following essential considerations for adopting a digital preservation strategy involving a system that selects the preservation formats for the electronic records.

First, it is necessary to consider establishing a system for the selecting preservation formats rather than directly presenting formats by type.

The analysis above shows that all four countries have their own criteria for selecting preservation formats. It is derived from a sense of purpose to standardize and achieve preservation goals. In Australia, this is accomplished by providing a detailed list of preservation formats, but there is a limitation in that it is difficult for archivists to make their own judgments about these types of formats without first being presented by the National Archives. On the other hand, South Korea and the US have designed their system for the selecting preservation formats to be flexible, allowing archivists to make their own assessments and choose the appropriate format. The flexibility of this system for the selecting preservation formats is advantageous as a strategy for responding to the rapidly changing electronic environment. This allows for the selection of different formats for different situations and conditions, and allows the archivist's professional judgment and knowledge of the institution to which they belong. Therefore, a preservation strategy for electronic records should be adopted in consideration of establishing a system for the selecting preservation formats rather than directly presenting formats by type.

Second, when establishing a selection system for preservation format, it is necessary to consider establishing an integrated format risk assessment system in conjunction with it.

Risk management is essential to ensure continued access and preservation of records. One way to manage these risks is to implement a format risk assessment system. DROID and PRONOM, developed in the UK, are reliable software that many archives use and can be helpful if there is no risk assessment system in place. However, it is helpful for archives to establish their own format risk assessment system to maintain the quality of their records from an archival perspective. In this regard, South Korea and the US have incorporated the scoring system used by the system for the selecting preservation formats into their risk assessment system, so that the risk assessment and preservation requirements of the format can be considered together. This approach is efficient because they use the same scoring system. Therefore, an integrated format risk assessment system at the stage of establishing a system for the selecting preservation formats would avoid duplication of effort and effectively allocate limited resources.

Third, when trying to categorize an electronic record, the first thing to consider is how the component is represented.

Electronic records must preserve both their attributes as digital resources and their attributes as records. In order to preserve the property of being a digital resource, the availability of the electronic record must be maintained. Unlike paper records, electronic records cannot retain their original functional properties if only the original bitstream is preserved. Given the volatility and unreliability of

these electronic records, archives set up strategies such as migration or emulation, where the format or software to choose depends on how the component is to be reproduced. Therefore, by default, the categorization of electronic records should take into account how the components are reproduced.

Fourth, categories need to be subdivided according to the Significant Property of the records.

When considering the attributes of an electronic record as a record, it can be categorized according to the purpose for which it was created. Recognizing these differences in Significant Properties and subdividing them into categories has the advantage of selecting a preservation format that is better suited for the long-term preservation of that category. For example, audio-type records include records containing voice (hereinafter referred to as voice records) and sound recordings recorded to preserve values such as intangible cultural assets (hereinafter referred to as sound recordings). For voice records, it is important to be able to accurately identify sentences, i.e. text, from the speech contained in the recordings. This is because voice records are produced for their evidentiary value. On the other hand, in the case of sound records, the purpose is to preserve historical, artistic, and cultural values, so recording must be done with high-quality equipment, and when recording multiple people at the same time, technical aspects such as separating channels according to instruments must be considered (Choi, 2010). Without considering the differences in the purposes of these two types, lumping them together in the same category may not preserve certain attributes of speech and sound records. In this way, when the same audio type recordings have different Significant Properties, it is necessary to subdivide the categories, and a separate system for the selecting preservation formats can be established.

## **CONCLUSION**

The electronic environment is characterized by continuous innovation and development, with new technologies and features constantly emerging. This has led to revolutionary changes in the production environment of electronic records and the management and utilization of produced data. In this environment, due to the system-dependent nature of electronic records, failure to adapt to changes in technology can make it difficult to access records, and there is a high risk of data loss. From this perspective, it is necessary to migrate the components of electronic records to modern formats in order to preserve the original functional properties and bitstreams of electronic records. The most important point in the migration is which format to choose. In this study, based on a comprehensive analysis of the strategies for the selecting preservation formats and category status of audiovisual records centered on the national archives of four countries, this study derived 4 matters that should be proactively considered when establishing strategies for the selecting preservation formats. The implications of this study can be applied in the design phase to reduce trial and error when implementing a system for the selecting preservation formats of electronic records.

This study does not cover specific and technical aspects, so it is necessary to study them in more detail. Therefore, research should be supplemented to practically establish a system for the selecting preservation formats of each type of electronic record.

## **ACKNOWLEDGEMENTS**

This research was supported by a fund from the Archive Management Research Program of the National Archives, Korea.



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# Analyzing the Current Status of Digitized Resources in National Libraries in Asia: Focusing on Korea, Japan and Vietnam

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## ABSTRACT

In AI era, the most basic foundation is the digitized resources. As a result, libraries in English-speaking countries have recognized the importance of digitizing information resources and have developed plans and directions for the development of digitization. On the other hand, research on digitized resources in Asia has remained largely unexplored. This study aims to analyze the current status of digitized resources of National Libraries in Asia and propose improvement plans. To archive this goal, we analyzed three representative national library websites: *the National Library of Korea; the National Library of Japan; and the National Diet Library of Vietnam*, and revealed the characteristics of the types of resources being digitized. The National Library of Korea and the National Diet Library of Japan segmented digitization types and offer various formats and search tools. The type of digitization at the National Library of Vietnam provided theses, historical information, and resources related to the Indochinese Peninsula, giving us a broader context for Southeast Asia. For future National Libraries in Asia, we propose digitization services including various search tools, research aids, history of digitized resources, audio services, and so on, which are in the same context as English-speaking National Libraries. This study is significant in that it raises awareness of the importance of digitization. Hopefully, the findings of this study can be used by National Libraries in the future as a guide to develop digital resources as a cornerstone of knowledge.

**Keywords:** Information Service, Information Resources, Digitization, Library

## **1. INTRODUCTION**

### **1.1 Motivation**

Currently, society has entered the era of digital transformation, where the explosive development and spread of digital technology has led to an increase in digitization and the use of digital technology in all sectors, including businesses, governments, institutions, and individuals. The library sector is also being heavily impacted by the digital transformation. Digital transformation is playing a big role in redefining the relationship libraries have traditionally had with books, offering digital books and electronic resources. Digitization refers to the process of converting existing physical resources into a digital format, and digitizing out-of-copyright books can make them freely and easily accessible online, making information more accessible. Many countries are now digitizing their collections, which involves scanning physical media such as paper books, documents, photographs, and film in libraries and converting them to digital form. One of the most famous examples of digitizing library collections is Project Gutenberg. Project Gutenberg, founded by American Michael Hart in 1971, is a project to collect, store, and distribute humanity's resources as electronic information, and to make freely available liberal arts books whose copyrights have expired. Named after Johannes Gutenberg, who rapidly expanded the transmission of knowledge through the printing press, it aims to create a virtual library that stores electronic documents on the internet and allows anyone to receive and read books for free. Project Gutenberg is digitizing classic works of English literature, primarily for English-speaking countries. Recently, libraries in English-speaking countries have recognized the importance of digitizing information resources and have developed plans and directions for the development of digitization. Meanwhile, research on digitized resources in Asian libraries is still somewhat scarce. Therefore, this study aimed to analyze the current status of digitized resources provided by National Libraries in three Asia countries.

### **1.2 Literature review**

As more and more libraries are digitizing and providing analog resources to improve users' access to information in the information era, the importance of research on library digitization is also increasing. Pendey and Misra (2014) laid the theoretical foundation for library collection digitization by discussing the need, benefits, and process of digitization [1], and Patra and Sahoo (2022) analyzed the research trends in library digitization over a 10-year period from 2010 to 2019 [2]. In a case-based study, Felgel (2015) shared the case of digitizing the collections of the Rochester Public Library [3], while Olubiyo, Achebe, and Olubiyo (2022) analyzed the current status of digitization in Nigerian university libraries and proposed remedial measures for the problems encountered in digitizing libraries [4]. In Asia, Yu (2015) presents the case of the Chinese Rare Book Digitization Project, a collaboration between the National Library of China and the Library of Congress.

To date, various studies have been conducted on the digitization of libraries, including theoretical studies and case analyses, but we found that most of them are focused on Western countries. Therefore, this study aims to provide basic resources for libraries to refer to when digitizing information resources by comparing and analyzing the status of library digitization in Asia, where there are relatively few studies on library digitization, and presenting the characteristics of best practices.

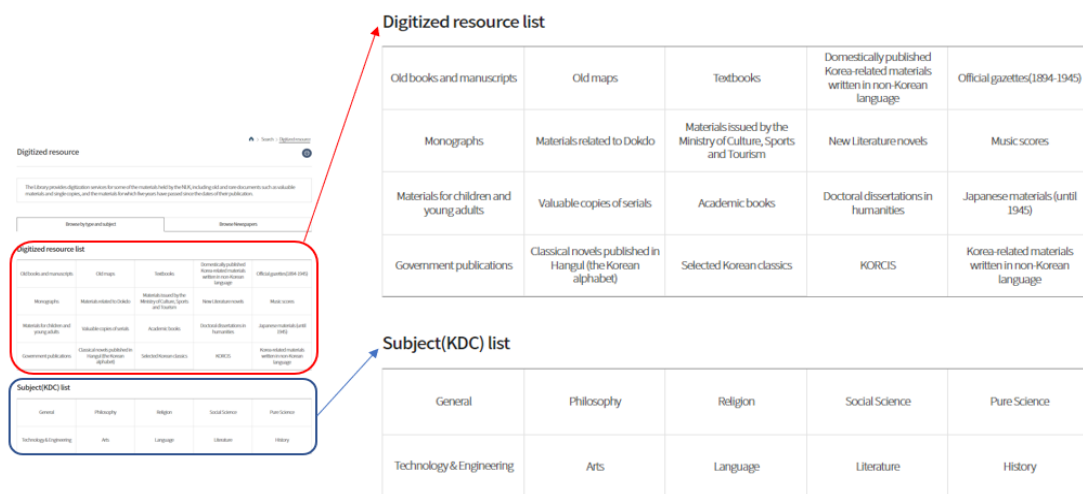
## **2. ANALYZE THE STATUS OF LIBRARY DIGITIZED RESOURCES**

The websites of the National Libraries of Korea, Japan and Vietnam, which serve as the representative libraries of their respective countries, were the focus of this study. In Asia, we focused on Japan, which has a similar public library operation and administrative system to Korea

and Vietnam, where the National Library of Korea signed a memorandum of understanding with the National Library of Vietnam in 2021 to provide Korean resources for five years. In addition, in April 2023, the Hanoi City Library in Vietnam was selected as a recipient of the first Overseas Library Creation Project, part of the Korean Ministry of Culture, Sports and Tourism's ODA program. Although, there are various studies on library digitization, including case studies, most of them are focused on the West. Therefore, we would like to analyze the current status of digitized resources in National Libraries in Korea, Japan and Vietnam.

## 2.1 The National Library of Korea<sup>2</sup>

The National Library of Korea is digitizing its collections in order to permanently preserve national knowledge information resources and promote openness, sharing, and utilization. In addition, it digitizes and services national literature, including old, valuable, and one-of-a-kind manuscripts, as well as resources that have been published for more than five years. Figure 1 shows the total of 21,875,231 digitized resources of the National Library of Korea, which are subdivided into 22 types of source lists and 10 types of source subject lists (KDC). Each digitized item has metadata that allows for detailed searching and even full-text searching. The formats are TIFF, JPG, PDF, HWP, and EPUB, with the appropriate format for the original text. The methods of using the original text are mainly divided into external use, use in the National Library of Korea, and use in the agreement library, but according to the Copyright Act article, 31, paragraph 1 and 3, user access is subdivided into six types. When using digitized resources, users may be inconvenienced by restrictions on access to some digitized resources due to copyright protection.



**Fig 1. Types of resources digitized by the National Library of Korea**

<sup>2</sup> National Library of Korea: <http://www.nl.go.kr>

## 2.2 The National Diet Library of Japan<sup>3</sup>

The National Diet Library of Japan allows you to search and view a variety of resources collected and stored in the NDL Digital Collection. Figure 3 shows a total of 8,572,342 digitized resources in the NDL Digital Collection in 16 resource types. Since 2013, NDL has operated the NDL Lab, which provides systems and resources to help develop the next generation of library systems. In August 2020, we added image search coverage, which means that out-of-copyright books and digitized resources that NDL Digital Collections makes publicly available through the internet are eligible for image search. Not only does it provide full-text search capabilities, but all digitized resources are metadata-enabled, allowing for detailed searches such as ISBN (International Standard Book Number) and NDC (Nippon Decimal Classification).

User access is limited to three things. "Available without login" is material that has been verified to be in the public domain or freely accessible on the Internet and is available to anyone with Internet access. "Digitized Content Delivery Service" refers to resources that are not in print or difficult to obtain and whose copyright has not expired, and is available only to officially registered users of the National Diet Library who reside in Japan and agree to the latest version of the Terms of Service. "NDL only" refers to resources that are not available online or through digitized content delivery services and are only available through a visit to the National Diet Library of Japan. In Japan, as in Korea, some digital resources may be inaccessible due to copyright issues, limiting the scope of users' access to the resources, and there is a limitation that some users may experience inconvenience in using the information.

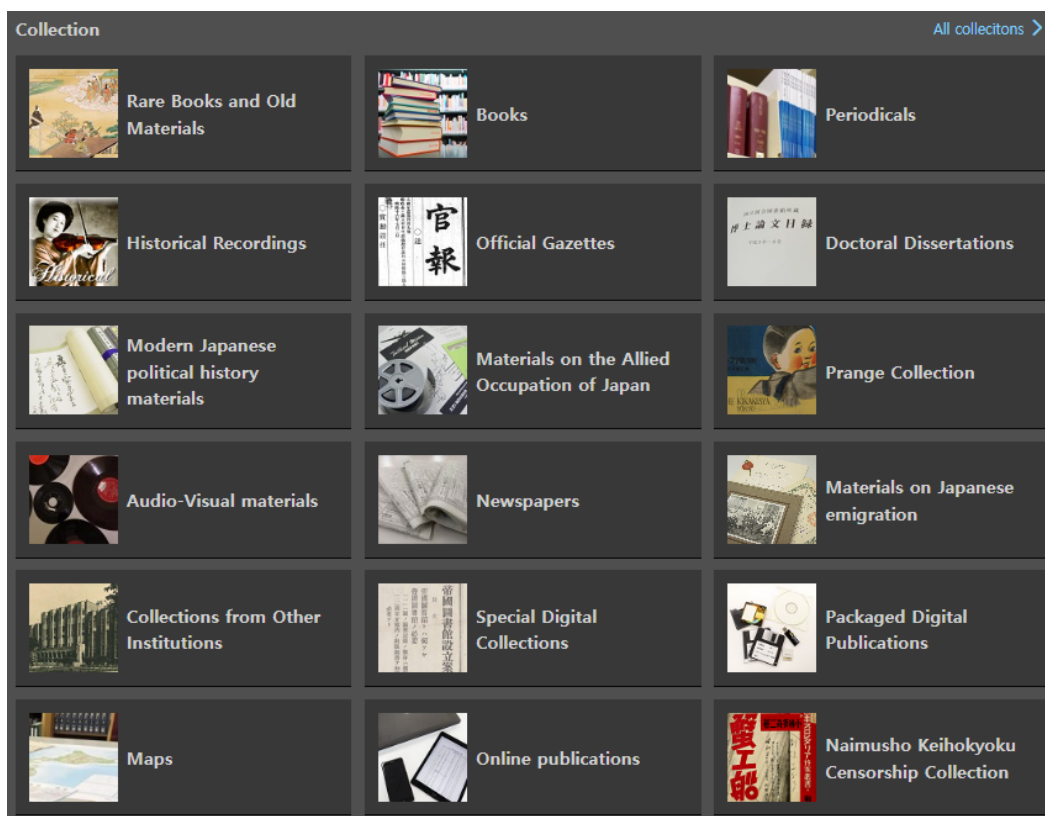


Fig 2. Types of resources digitized by the National Library of Japan

<sup>3</sup> National Diet Library of Japan: <http://www.ndl.go.jp>

## 2.3 The National Library of Vietnam<sup>4</sup>

The National Library of Vietnam is the central library of Vietnam and currently holds more than 2.5 million documents, including great cultural treasures from the 17th century. As shown in Figure 2, there are five types of resources: doctoral dissertations, Books of Chinese characters, Books of Indochina peninsula, Indochina peninsula newspapers and magazines, CD-ROMs, and DVDs, and more than 160,000 resources are available. We found that Vietnam's National Library focuses on researchers' dissertations and historical resources on the Indochina Peninsula rather than providing the original texts of famous literary works, making it difficult to provide equal access to information services for all users. In addition to the integrated search function, there is only a year filter and a list that lists all documents, and metadata is only provided for some documents, which is disappointing in terms of search service. The National Library of Vietnam currently provides digitized resources only as image files and does not apply OCR, so it is not possible to search the original text. Therefore, it is necessary to provide digitized resources in various formats to expand users' access points, and to apply OCR functions to the image files provided to provide original search services.

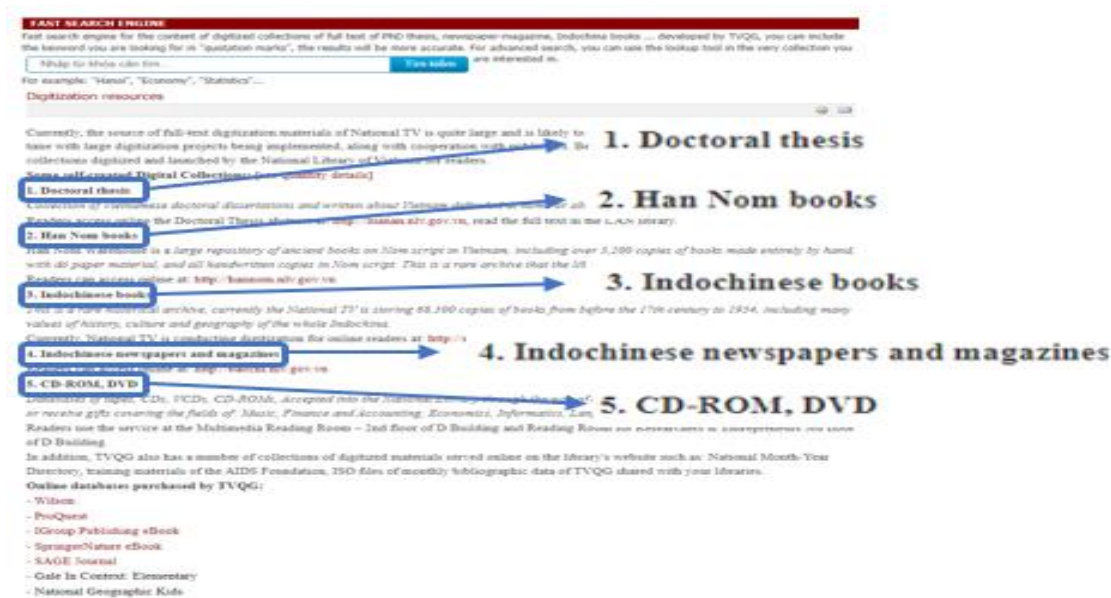


Fig 3. Types of resources digitized by the National Library of Vietnam

## 3. COMPARATIVE ANALYSIS

### 3.1 Comparison of digitized resources: Korea, Japan and Vietnam's National Libraries

According to a comparative analysis of the digitized resources of National Libraries in Korea, Japan and Vietnam, the National Library of Korea has the largest number of 32 material types and 21,875,231 items, and provides full-text services suitable for digitized resources in various formats. In addition, metadata is also provided for each digitized resource, enabling integrated search, detailed search, and original search. However, there was a limitation that if access is restricted due to copyright issues, it may cause inconvenience to some users and limit the scope of material use, so it was necessary to relax the copyright management system.

<sup>4</sup> National Library of Vietnam: <https://nlv.gov.vn>

<sup>5</sup> Indochina peninsula: A large peninsula occupying the continental part of Southeast Asia

Vietnam's National Library, on the other hand, is the smallest of the three, with five types of resources and about 160,000 items. The digitized resources exist only as image files and do not provide OCR, so it is impossible to search for the original text. Metadata is also only available for a subset of resources, so there are no search capabilities beyond title searching for digitized resources. Rather than providing full texts of famous literary works, the site focuses on articles for researchers and resources related to the history of the Indochina Peninsula, making it difficult for all users to fully utilize the service.

The National Diet Library of Japan offers unified search, image search, full-text search, and detailed search, and is the only one of the three countries to offer image search. It provides full-text services through various data types and search methods, but like Korea, there are some resources that can only be accessed by visiting the building. Sejong City, South Korea, signed a business agreement with the National Library of Korea to share knowledge information and spread reading culture, allowing users to access the library's resources for free without a visit. Since July 2018, we have fully funded library compensation for use of copyrighted resources. By borrowing from the Korean example, we can solve the difficulty of accessing resources due to copyright issues.

**Table 1. Compare digitized resources from the National Library of Korea, Japan and Vietnam**

	Korea		Japan	Vietnam
Number of digitized resource types	32		16	5
Number of resources digitized	21,875,231		8,572,342	About 160,000
Search Methods	Integrated search	Y	Y	Y
	Search for images	N	N	N
	Detailed Search	Y	N	N
	Search for the original text	Y	N	N
Availability of Metadata	Y		Y	Partial
Format type	TIFF, JPG, PDF, HWP, EPUB		JPG, PDF	Image
User Access Methods	<ul style="list-style-type: none"> <li>- Free access</li> <li>- National Library of Korea (Free)</li> <li>- National Library of Korea &amp; Partner Libraries (charge per print)</li> <li>- National Library of Korea &amp; Partner Libraries (charge per view/print)</li> <li>- National Library of Korea, Partner Libraries (public libraries only) &amp; Regular membership</li> <li>- National Library for Children and Young Adults, National Library of Korea, SEJONG (Free)</li> </ul>		<ul style="list-style-type: none"> <li>- Available without login</li> <li>- Available with Digitized Contents Transmission Service</li> <li>- Available only at the NDL</li> </ul>	All users

### 3.2 Suggestions for the future of digital resources in Asia

The National Library of Korea organizes its collections by type to make it easier for users to find the information they're looking for, so they can find what they need quickly and efficiently. In addition, the National Diet Library of Japan is the only one of the countries analyzed to offer image search. Segmenting the types of digitized resources and providing services such as image search capabilities can help users

get the information they need more efficiently. The National Library of Vietnam also provides books, newspapers, and magazines related to the Indochina Peninsula among the types of resources it digitizes, allowing for a broader context to include resources related to Southeast Asia as well as Vietnam. By borrowing from the examples of Korea, Japan and Vietnam National Libraries, we can improve the UI/UX design to make the service more convenient for users, and introduce personalized recommendations to provide information tailored to users' preferences and interests.

Meanwhile, English-speaking National Libraries are providing digitized resources in many aspects, including collection items, articles and essays, brief histories of those resources, series, related online collection homepages, and related content. In addition, we strived to fulfill the information needs of users by providing additional functions such as exhibition lists and research aids. Not only that, but it also provides listening capabilities so that users with various characteristics, such as blindness and illiteracy, can access digital resources. Borrowing from the example of English-speaking National Libraries, Asian National Libraries could improve user convenience by providing information on the history, background, purpose, and related content of the digitized resources along with audio services.

#### **4. CONCLUSION**

This study explores and compares the digital libraries of Korea, Japan, and Vietnam through a current analysis of the digitized resources of the National Libraries in each country. The National Library of Korea and the National Diet Library of Japan had the upper hand in terms of various types of digitized materials, detailed search capabilities, and full-text services in various formats. However, due to some copyright issues, access was restricted, causing inconvenience to users. Therefore, if Sejong City, South Korea, borrows the example of signing a business agreement with the National Library of Congress to share Knowledge information and spread reading culture, it will be possible to solve the difficulty of using resources due to copyright issues. The National Library of Vietnam focuses primarily on theses for researchers and resources related to the history of the Indochinese Peninsula, making it difficult to see how the library is providing equitable access to digitized resources for all users. However, it was possible to grasp a wide range of cases in Southeast Asia by providing related data on the Indochina Peninsula. It is expected to provide a wealth of services in the future through its digitization plan, which is planned to run through 2025.

If other libraries and information organizations take the approach of borrowing the segmented type and image search that are typical of Korea and Japan, users will be able to get the information they need more efficiently. In addition, National Libraries in Asia will need to provide digitization services in the same context as English-speaking National Libraries, including various search tools, research aids, history of digitized materials, and audio services.

By comparing and analyzing the digitization current status of National Libraries in Asia, this study identifies the diverse and characteristics of digitization across countries. The results of the study can be used as a reference for libraries around the world as they look for ways to improve digitization. However, the study was conducted in only three Asian countries and was limited to National Libraries, so it was not possible to analyze the digitization status of all libraries in those countries. Therefore, a follow-up study that expands the number of countries and extends the scope of the study to public libraries should be conducted.

#### **ACKNOWLEDGEMENTS**

This work was supported by the National Research Foundation of Korea (NRF) grants funded by Korea Government, the Ministry of Science and ICT (NRF-2021R1I1A3047435)



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# Toward Network Analytic for Knowledge Graph Generation: a Case Study on Sustainable Development Goals

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## ABSTRACT

This paper introduces the *Thai Knowledge Graph Generation (ThaiKGEN)* approach for converting unstructured Thai-language data into comprehensive *knowledge graphs*. Leveraging *network text analysis (NTA)* techniques, entities and relations are extracted and represented in a structured format. The resulting KG provides an enhanced representation of information, facilitating in-depth analysis and insights. The effectiveness of *ThaiKGEN* is demonstrated through a case study on Bangkok's urban problems data, showcasing its ability to generate a comprehensive knowledge graph and interconnected Thai Encyclopedia named *Language and Semantic Technology Encyclopedia (LSTPedia)*. By leveraging *ThaiKGEN*, stakeholders gain access to structured and interlinked information, enhancing knowledge dissemination and supporting sustainable development efforts.

**Keywords:** knowledge graph, network analysis, sustainable development goals

## INTRODUCTION

In the pursuit of progress and development, nations worldwide encounter social, economic, and environmental challenges. Recognizing the complexity of addressing these challenges individually, some nations form alliances to collectively advance their development agendas. However, diverse backgrounds and objectives hinder finding collective solutions. To overcome this, the United Nations established the *Sustainable Development Goals (SDGs)* in 2015. The *SDGs* serve as a global blueprint for achieving sustainable development by 2030, addressing global challenges and promoting prosperity, peace, and well-being for all.

Thailand demonstrates commitment to the *SDGs* through various contributions, including aligning national policies, implementing targeted programs to address specific goals, and actively participating in international collaborations. However, analyzing problems presents significant challenges. The complex nature of these problems often involves multiple factors and requires a multidisciplinary approach. Additionally, the availability and quality of data for analysis can vary, making it crucial to enhance data collection and management systems.

When faced with complex analysis challenges that require multidisciplinary knowledge and a profound understanding of the topic, leveraging ontologies (Uschold & King, 1995) and *knowledge graphs (KGs)* (Hogan et al., 2021) within structured data is a promising approach. By converting unstructured data into a structured format, such as a network or KGs, a more in-depth analysis can be conducted to identify underlying causes and facilitate the discovery of sustainable solutions. Furthermore, the enrichment of structured data through the incorporation of open data sources (Rossanez et al., 2020) can be applied to enhance the KG's performance, enabling a more comprehensive analysis and exploration of intricate relationships and dependencies. Therefore, enhancing the ability to unravel complex problems and provide alternative solutions to support decision-making processes.

This paper aims to approach this challenge by proposing two primary contributions. (1) Introducing the utilization of *NTA* technique to analyze and extract entities and relations from unstructured Thai-language data to facilitate KG generation (2) Proposing the *Thai Knowledge Graph Generation (ThaiKGEN)* approach to support the development of *Language and Semantic Technology for Thai Encyclopedia (LSTPedia)*<sup>6</sup>, an encyclopedia aims to extract structured and interlinked information from available Thai-language data, transforming it into a structured format that can be queried, linked, and integrated with other datasets, therefore enhancing accessibility and knowledge dissemination.

The rest of the paper is organized as follows: Section II provides a comparative analysis of related works, highlighting the novelty of the paper. Section III presents the core pipeline of *ThaiKGEN*, explaining the methodology and techniques used for data extraction and structuring. In Section IV, a case study on the application of *ThaiKGEN* to the information obtained from the Bangkok citizen empowerment platform is presented, showcasing the implementation details. In Section V, discussing the obtained results from the preliminary study and the limitation of the approach. Finally, Section VI concludes the paper by summarizing the findings, emphasizing its contributions, and outlining future research directions.

## RELATED WORKS

*Network Text Analysis (NTA)* technique (Carley et al., 2009; Daems et al., 2014; Popping, 2003) has gained popularity as a method for analyzing Thai-language text data. Its effectiveness in extracting meaningful information and uncovering relationships within Thai terminologies has advanced fields like natural language processing and information retrieval. *NTA* offers valuable insights into the structure and dynamics of the Thai language, enabling knowledge discovery and linguistic analysis in diverse academic domains. For instance, (Sophaken et al., 2023) leveraging *NTA* technique to detect domain switching in Thai multidisciplinary online news to reduce ambiguity for readers.

The *NTA* workflow (Sophaken et al., 2023) consists of six phases. (1) Firstly, in the data observation phase, the researchers surveyed and selected the data sources for analysis, defining the scope and features of the data to align with the research objective. The data type used was plain text from electronic news articles. (2) Secondly, the data collection phase involved scraping and collecting

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<sup>6</sup> Language and Semantic Technology for Thai Encyclopedia, <https://lstpedia.org/>

data from reliable sources, storing them in a suitable format for further analysis. The authors extracted Thai electronic news article contents, including domain, keywords, publish date, and source. (3) The third phase, data preprocessing, included two sub-processes: data cleaning and data formatting. Data cleaning involved screening and removing insignificant or unreliable data, while data formatting transformed the data into appropriate formats for machine analysis. (4) The fourth phase, filtering potential terminologies, focused on determining keywords that had a high influence on the article's domain, using frequency range-inverse frequency metrics to create a list of important keywords for topic modeling. (5) In the fifth phase, topic modeling was applied to classify terms based on their related domains using *Latent Dirichlet Allocation (LDA)* (Blei et al., 2002). This statistical model segmented the lexical data using a bag-of-words approach and reference list of terminologies and features. (6) Finally, in the sixth phase, network text visualization was performed to represent the data as a co-occurrence network, visualizing the relationships among terminologies and attributes.

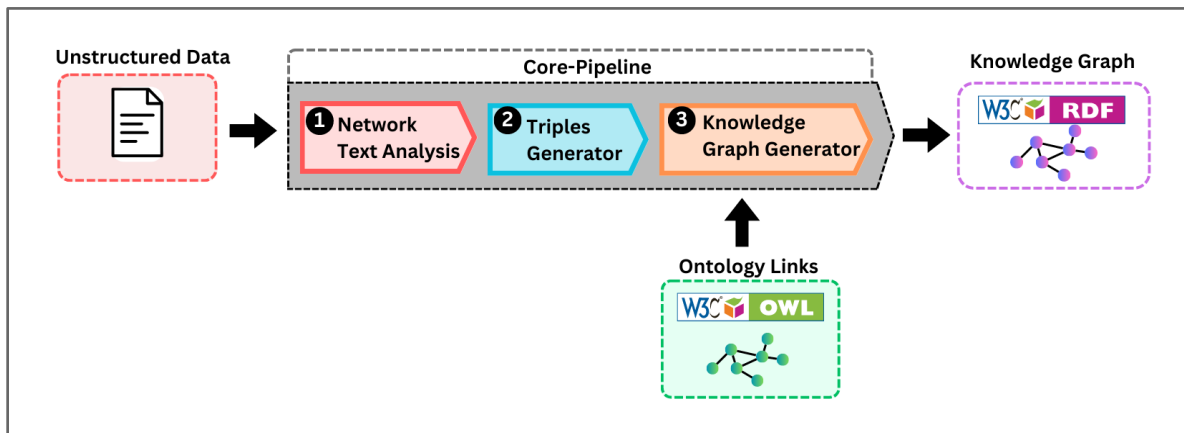
**Knowledge Graph Generator** (Rossanez et al., 2020) is a pipeline used to convert unstructured text data into a semantic representation network known as a knowledge graph. It has gained significant attention in various domains, with numerous studies and applications showcasing its potential. By leveraging knowledge graph generation, several benefits can be addressed, for instance: enabling more comprehensive analysis, efficient information retrieval, and enhanced knowledge representation. The resulting knowledge graphs serve as valuable resources for extracting insights, discovering relationships, and facilitating decision-making processes in diverse fields of research and application.

Rossanez et al. presented a semi-automatic method for generating KGs from biomedical texts in scientific literature. The method utilizes natural language processing techniques to extract and represent knowledge from unstructured texts. Entities and relations in the KGs are linked to concepts from existing biomedical ontologies. The effectiveness of the method is demonstrated through the generation of KGs from abstracts of scientific papers on Alzheimer's Disease. The generated KGs are evaluated by physicians, who compare the extracted information with their manual extraction from the abstracts. The experimental results show the quality of the generated KGs, with a large number of triples extracted and successful ontology linking. The study concludes that the proposed method effectively builds ontology-linked KGs that can enhance research in various domains and contribute to the advancement of knowledge in those fields.

This paper, therefore, presents an approach of KG generation by analyzing the NTA technique. As an expected result, the generated KGs provide knowledge resources to represent structured knowledge enabling advanced information retrieval and reasoning capabilities. On the other hand, the NTA technique supports us in extracting and visualizing meaningful insights from text data by analyzing the relationships between words and entities. By combining these two approaches, we aim to enhance the quality and comprehensiveness of KGs. In this paper, the authors propose a working pipeline including the key processes in utilization of NTA for KG generation. We demonstrate the effectiveness of our approach through a case study and provide insights into the potential applications and future research directions in this area.

## METHODOLOGY

As shown in Fig.1, the pipeline of *ThaiKGEN* consists of 3 key processes, and the descriptions in each process are as follows.



**Fig. 1. A working pipeline of Thai Knowledge Graph Generator (ThaiKGEN)**

First, the network text analysis is divided into two processes. (a) The data preprocessing step involves the use of natural language processing (NLP) techniques to extract significant individual terms from the text corpus. Additionally, low-frequency terms are filtered out to ensure the focus on relevant information. (b) The next process is the co-occurrence network generation, where a graph is constructed based on the frequency of term co-occurrences obtained from the process (a). This network provides a visual representation of the relationships between terms within the corpus, enabling a deeper understanding of the underlying connections.

Second, the following step is the triples generator, which involves generating subject-predicate-object premises in the form of triples. These triples serve as the foundation for further graph generation and analysis.

Lastly, the KG generator takes the triples from the previous process and enriches them with ontology links sourced from public open data. This step enhances the understanding of the topic by incorporating additional contextual information. The result is a KG that can be further analyzed and explored.

## PRELIMINARY STUDY

### A Case Study

To demonstrate the capability of the ThaiKGEN we select the case study of data gathering from the online citizen engagement and empowerment platform for reporting problems occurring in Bangkok, called *Traffy Fondue*<sup>7</sup> implemented by the Bangkok Metropolitan Administration (BMA) and National Science and Technology Development Agency (NSTDA).

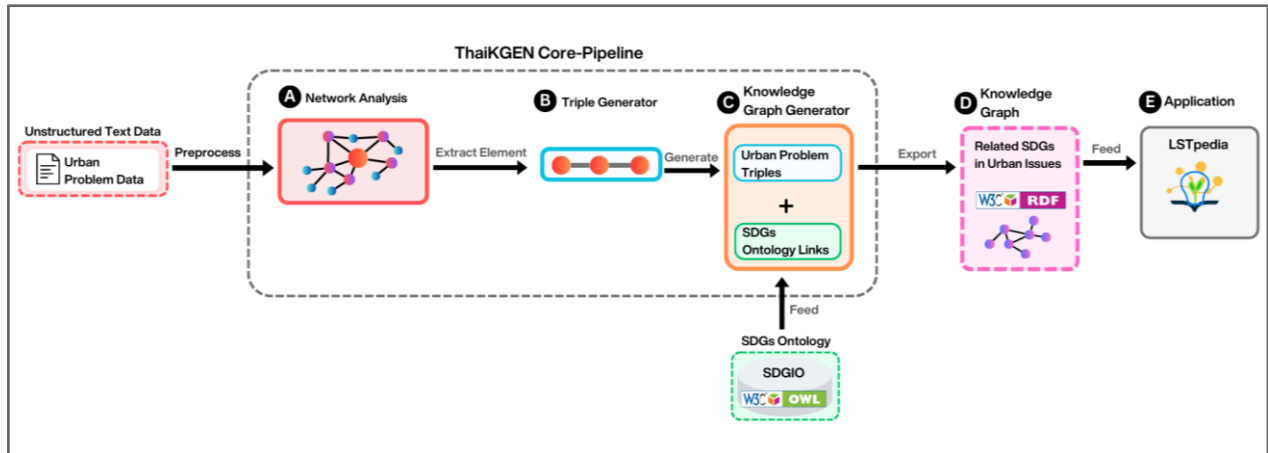
This paper intends to represent interdisciplinary among the Traffy Fondue data and SDGs knowledge existing in SDGIO [cite]. Its main objective is to have citizens participate in government activity and contribute to SDGs by submitting complaints and reporting problems that occur in daily life to the administration. For instance: “Trafficlight in this street are not working.” or “Sidewalk on this street is broken and unwalkable.”. In 2023, This platform proved to be highly effective considering the quantity and quality of the information acquired via crowdsourcing.

<sup>7</sup> Traffy Fondue, an online citizen engagement and empowerment platform for reporting problems occurring in Bangkok, <https://www.traffy.in.th/>

In the methodology of this academic publication, Fig.3 illustrates the ThaiKGEN pipeline adapted to the case study and the pipeline consists of five key processes. The explanations in each process are as follows.

## Experiment

Fig. 2 illustrates the ThaiKGEN pipeline applied to the case study of Traffy Fondue. The pipeline consists of five key processes. The explanations in each process are in the following.



**Fig. 3. Applying the working pipeline of ThaiKGEN for the case study of SDGs**

- *The (A) part* is employing a network text analysis technique, which involves two processes: (a) data preprocessing and (b) co-occurrence network generation. In the data preprocessing phrase, various NLP techniques. First, tokenizing the text, transforming it into a list of individual terms. Then, applied part-of-speech (POS) tagging to assign a specific POS label to each term. Following by removing insignificant terms from the analysis. These include terms associated with insignificant POS, stop-words, or special characters. Finally, construct co-occurrence networks from potential terms using a trigram approach. Co-occurrences, capturing instances where terms appear together within a certain context. Throughout this process, pairs of terms that have either extremely high or low frequencies are filtered to eliminate biases caused by high frequency common terms that are insignificant to the context.
- *The (B) part* involves the generation of triples to represent the relationships between terms within the data in a triples format. This step enhances the understanding of the word relations within the dataset.
- *The (C) part* is constructing the KG, the urban problem data obtained from the previous step is utilized. The data is further enriched with *SDGs* ontology links sourced from open data, specifically utilizing a dataset from *Sustainable Development Goals Interface Ontology (SDGIO)* (Jensen, 2016). This process enables a deeper understanding of the *SDGs* and facilitates the creation of a comprehensive KG.
- *The (D) part* is the core outcome from the (A) part to (C) part for generating KG, which integrates the rich knowledge of *SDGs* from the SDGIO ontology and real-world urban problems extracted from unstructured text. This KG serves as a valuable resource, providing in-depth insights into the *SDGs* and urban challenges.

- *The (E) part* is to make the KG accessible by uploading it to LSTpedia. This ensures that other researchers and organizations can utilize and benefit from the KG in their own work and initiatives.

By utilizing our methodology with the Traffy Fondue dataset, real-world urban areas information in Thailand can be obtained. The KG generated from this dataset allows for a tangible application, as it enables the connection to relevant organizations in order to identify the cause of the problems and reach sustainable solutions.

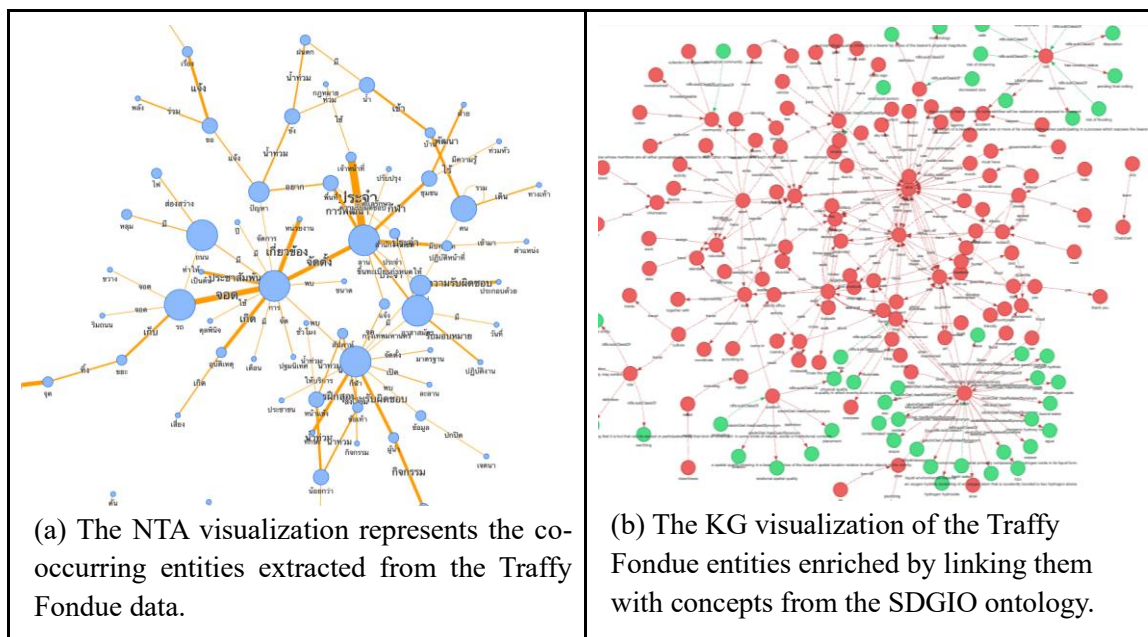
## RESULT AND DISCUSSION

As shown in Fig. 4, the results of this preliminary study are visualized in two graphs: (a) The NTA visualization and (b) the KG visualization. The details in each graph visualization are elaborate and discussed in the following.

The co-occurrence entities were carried on enriching with the ontology from SDGIO generate our KG using the ThaiKGEN, as shown in Fig. 3 (b). The red node represents the original data from Traffy Fondue and the green node represents the ontology linked from SDGIO. The KG generated in this preliminary study plays a crucial role in identifying and understanding the significant causes of problems in Bangkok, while also highlighting their connections to SDGs. By enriching the KG with ontology links from the open data SDGIO, a comprehensive and holistic representation of the urban challenges and their relationship to SDGs is achieved. This KG serves as a powerful tool for visualizing and analyzing the complex interplay between various factors and their impact on the city's development.

Despite its potential, the approach is still constrained. One notable concern is the presence of terms with extremely high or low frequencies, which can introduce bias into the analysis. However, this issue can be addressed by implementing a filtering mechanism to remove terms with extreme frequency value. Therefore, the primary constraint of this approach lies in the inherent ambiguity and the complexity of the Thai language, compounded by the current limitations of NLP technology in effectively analyzing the text. The intricate linguistic structures, cultural references, and idiomatic expressions within Thai text pose challenges for accurate interpretation and analysis. Furthermore, the insufficiency of NLP tools and resources specifically tailored for the Thai language further hampers the comprehensive understanding of the text.

Addressing these limitations necessitates advancements in NLP technology to better handle the complexities of the Thai language, along with the development of specialized linguistic resources to support accurate and reliable text analysis. Only through such improvements can we overcome the inherent ambiguity and insufficiencies and unlock the full potential of the proposed approach for analyzing Thai text.



**Fig. 4. ThaiKGEN pipeline adapted to the case study.**

## CONCLUSION

This paper has presented a approach for generating a Thai KG using the *Thai Knowledge Graph Generator (ThaiKGEN)*. Through the application of network text analysis techniques, unstructured data from various sources was extracted and structured into a comprehensive KG. The case study on *Traffy Fondue* demonstrated the effectiveness of *ThaiKGEN* in generating a comprehensive KG and contribution to Thai Encyclopedia, named *Language and Semantic Technology Encyclopedia (LSTPedia)*. The comparative analysis highlighted the unique contributions of this research in advancing the field of Thai language and semantic technology. Nevertheless, it is important to acknowledge some limitations identified in this study. The performance of ThaiKGEN can be further improved in terms of handling ambiguous or polysemous entities and resolving entity disambiguation challenges.

Moving forward, future research can focus on exploring additional enhancements and applications of ThaiKGEN, thereby paving the way for further advancements in knowledge representation and dissemination. Overall, this paper contributes to the expanding body of literature on KG generation and offers valuable insights for researchers and practitioners in the field.

## ACKNOWLEDGEMENT

This paper is partially supported by the National Science and Technology Development Agency (NSTDA) and Siam Commercial Bank (SCB) under the Junior Science Talent Project (JSTP-SCB) bachelor's scholarship program. Secondly, the authors are immensely grateful for linked open data, Thai Wikidata are kindly provided by LSTPedia.org, Language and Semantic Technology Laboratory (LST), National Electronics and Computer Technology Center (NECTEC) that provided insight, necessary resources, and expertise that greatly assisted the research. Finally, the authors would like to show our gratitude to the Department of Computer Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi (KMUTT) for providing the laboratory and necessary equipment.



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# **An analysis of Book-Borrowing Behaviors of Users at the John F. Kennedy Library, Office of Academic Resources Using Association Rule Mining**

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## **ABSTRACT**

This study aims to analyze the book-borrowing behaviors of users based on book-borrowing records at the John F. Kennedy Library, Office of Academic Resources. This study employed an association rule mining, a quantitative research method, to explore relationships among book-borrowing behaviors based on the records of the John F. Kennedy Library in the academic year of 2021 (from 27 June 2022 to 27 March 2023). The data were analyzed by descriptive analysis and association rules. The findings revealed that in the academic year 2021, most of the users were undergraduates (68.94%), the following were lecturers (18.76%), and the last were postgraduates (8.01%). Moreover, the most borrowed book category was General Collection (77.30%), the following was Fiction (4.64%), and the last was Old Book Collection (3.40%). Additionally, the results from the association rules that set a support threshold of 5% and minimum 50% confidence interval revealed that a relationship between undergraduates and collections of books indicated five rules, and contents of the books indicated 12 rules. Further, the relationship between lecturers and collections of the books indicated five rules, and the contents of the books showed 11 rules.

**Keywords:** Book-borrowing behaviours, Association rule, FP-Growth, Users, Data mining techniques

## **INTRODUCTION**

Libraries are the key to self-study. Its main duty is to provide support as a source of information and resources, such as digital books, research, serial publications, novels, etc., for teachers, staff, and students (Chuenwattana, 2002). Moreover, libraries select and collect all information resources as necessary and consistently in line with the University's objectives. This is to provide information, resources, and services that meet the needs of users for various purposes conveniently and fast.

John F. Kennedy Library Academic Resources of Prince of Songkhla University is a unit with the main mission of providing resources in various forms that are consistent with the behaviors of users both inside and outside the university as well as being a source of knowledge in a variety of disciplines

with an emphasis on expertise in the humanities and social sciences and applied science under the context of a multicultural society in the southern border provinces.

In addition, the library is responsible for services that respond to the needs of users, especially the inter-library borrowing service and online book borrowing service, which are the main services that most lecturers, staff, and students use.

Analysis of resource usage behaviors of service users is a way to make executives and those involved, such as procurement and strategic planning departments, aware of the behaviors of using information resources in the library and the quantity and type of resources used. This information can be managed to improve the management and procurement of resources to meet real needs.

However, the study of resource uses behaviors primarily relies on observation and statistical data. Also, it was found that the increasing power of computer technology has dramatically increased data collection, storage, and manipulation ability as data sets grow in size and complexity (Joshua et al., 2016). Over the years, libraries in universities and other educational institutions have gathered much data on books borrowed by students, yet the valuable knowledge embedded in these data has remained untapped. In many cases, students do not find required books in the library, or probably the books have been borrowed by some other students. There are even a lot of books that students have never read. In many other cases, library management faces the challenge of what book to buy that would benefit the students and how to place these books on shelves. There is an urgent need for systems that can help library management make informed decisions to address these issues (Joshua et al., 2016).

An in-depth analysis of the data stored within many databases can be helpful when analyzing the correlation and probabilities of borrowing resources in each category. In addition, the collection of books in the library can sometimes be confusing for borrowers due to the large volume of books in the library and a variety of styles and genres.

Therefore, the use of data mining techniques is an important solution to this problem. In this regard, the application of the association rule algorithm using FP Growth was used to find the rule of association and connections among the datasets of the history of book borrowing in the database that lecturers and students borrow most of, which will be considered the level of support and confidence values (Andi & Utami, 2018).

Therefore, the researchers were interested in analyzing in-depth information about user behaviours through book retrievals with association rule mining. The analysis results are expected to be used to predict the behaviors of service users, including applying to the John F. Kennedy Library service arrangement, Prince of Songkla University.

In addition, it can be used to support the management's in-depth decision-making in determining the strategy and direction of the library in line with the needs and current situation in the area's context, including the unit's main mission. This in-depth behavioral analysis will provide librarians with helpful information to recommend resources consistent with the analysis of the book-borrowing behaviours.

In this regard, the analysis of book-borrowing trends will determine an operational plan for procurement consistent with the behaviors and needs. The results also help design a user experience that can appropriately support different types of users, such as the developing book recommendation system, book tracking system, retrieval notification system, and a self-book renewal application.

## **OBJECTIVE**

This study aims to analyze the book-borrowing behaviors based on book-borrowing records of the John F. Kennedy Library, Office of Academic Resources.

## LITERATURE REVIEW

### A. Association Rule Mining

Association rules are rules developed by the data mining technology center for mining project relevance. Agrawal proposed them in 1993 to reveal potential relationships between data items (Agrawal et al., 1993). Support and trust are essential concepts for describing association rules. Regarding book borrowing, taking borrowing computer books and literature books as examples, the support reflects the probability that computer books and literature books appear simultaneously in the entire data item set, whereas the confidence reflects the probability of borrowing literature books after borrowing computer books in the process of borrowing books (Zhou, 2021). The association rules that are interesting and valuable to readers are those with a high level of confidence and support. Strict rules are those that meet both the minimum support threshold and the minimum confidence threshold (Ji et al., 2020). The data mining process of association rules is primarily divided into two steps: the first step is to identify all qualified frequent item sets from the database (such as the book borrowing database) (such as the correlation between two books and three books until the correlation between books cannot be generated); the second step is to identify all the strict rules from the frequent item-sets (such as the correlation between all books). Because association rules are primarily extracted from readers' borrowing histories, readers' scoring data are not required to ensure the real-time performance of recommendation data.

The application of association rule mining techniques permits strategic library management decisions. Anitha et al. (2011) worked on a library management system utilizing association rules in which they elucidated the modules involved in mining. Anuradha et al. (2011) used an association rule mining technique to determine the relationship between the most frequently borrowed books for a given semester based on the conditions of the allotted time and the maximum number of books issued. Also, they utilized the data mining association rule to examine the books of the same cluster that students had borrowed.

### B. FP-Growth Algorithm

Frequent Pattern Growth (FP-Growth) is an alternative algorithm that can be used to identify the set of data that appears most frequently (frequent itemset) in a data set (Patil et al., 2016). Candidates must be generated on the a priori algorithm to obtain frequent item sets. However, the FP-Growth algorithm did not generate candidates because it used the concept of the development tree to find frequent item sets. The data structure utilized by the FP-Growth algorithm is a tree called FP-Tree. By utilizing FP-Tree, the FP-Growth algorithm can directly extract FP-Tree's frequent itemset. Using the FP-Tree data structure, the FP-Growth algorithm will excavate the frequent itemset by invoking the FP-Tree (Feng et al., 2016; Angeli et al., 2017).

### C. Evaluation Measurements

– Support:  $Support(x \Rightarrow y)$  indicates the probability that  $x$  as the preceding item and  $y$  as the following item will occur concurrently in all transactions. Minimum support is the minimum probability of simultaneous occurrence of  $x$  and  $y$ , which serves as a support evaluation threshold (Zhou, X., 2021). The expression for the formula is:

$$Support(x \Rightarrow y) = \frac{Support(x \cup y)}{|D|} \quad (1)$$

Where:  $Support(x \Rightarrow y)$  represents the number of simultaneous  $x$  and  $y$  database transactions, and  $|D|$  represents the total number of database transactions.

– Confidence:  $Confidence(x \Rightarrow y)$  is the probability that  $x$  will appear as the antecedent and  $y$  will appear as the consequent in all transactions simultaneously. The minimum confidence is a threshold used to assess the reliability of confidence and represents the minimum reliability of association rules. The expression for the formula is:

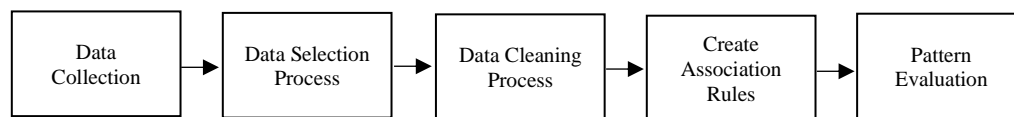
$$Confidence(x \Rightarrow y) = \frac{Support(x \cup y)}{Support(x)} \quad (2)$$

Where:  $Support(x)$  represents the number of transactions of  $x$  in the database.

Frequent item-set: if the item-set's support exceeds the minimum support threshold, the item-set is referred to as frequent; otherwise, it is referred to as infrequent.

## METHODOLOGY

This paper studies association rule mining from the John F. Kennedy Library's data warehouse. The methodology scheme as following steps in Fig. 1.



**Fig. 1. Methodology**

### A. Data Collection

In this research, we used a data mining technique to analyze data collected by the John F. Kennedy Library's data warehouse with SQL Commands, as follows in Table 1.

**Table 1. Data Collection**

Table	Attribute	Meaning
User	Patron_ID	User identification code
	Patron_Type	Type of user
Book	BIB_ID	Book identification code
	Collection	Collections of the books
	Call_No	The symbol represents the contents of the books.
Borrowing	Patron_ID	User identification code
	BIB_ID	Book identification code

### B. Data Selection Process

The data selection process allows for the selection of relevant data needed for the execution of a defined data mining task. The study collected records of the JFK Library's data warehouse consisting of:

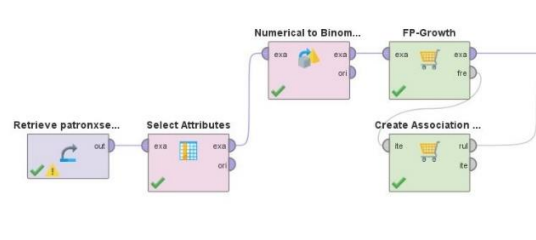
- User information including Patron\_ID and Patron\_Type total of 20,985 records.
- Book information including BIB\_ID, Collection, and Call\_No total of 233,400 records.
- Borrowing information in the Academic Year 2022 (27 June 2022 to 27 March 2023), including Patron\_ID and BIB\_ID of 24,021 records.

### C. Data Cleaning Process

The data cleaning process includes checking for missed values and cleaning up by filtering selected data using Microsoft Excel software.

### D. Create Association Rules

The association rules were created by employing the data mining tool, RapidMiner software with the FP-Growth algorithm to find the frequency set in the following steps (Rapidminer, 2018; Chonglomkrod et al., 2022) in Fig. 2.



**Fig. 2. Process design in RapidMiner program**

The frequent item sets generated by FP-Growth operators were provided to create association rules. The resultant association rules can be viewed in the results workspace. This process was run with varied parameters for a better understanding of how it performs.

### E. Pattern Evaluation

This step involves identifying suitable interesting patterns using the confidence interval for evaluation. The association rules in this study were selected using a support threshold of 5% as it is associated with two or more items with higher than 60% confidence interval.

## RESULT AND DISCUSSION

### A. Descriptive Analysis

Analyzing the book borrowing of the John F. Kennedy Library, Office of Academic Resources. Prince of Songkla University in the academic year of 2022 (27 June 2022 to 27 March 2023) total of 24,021 records found:

User types consist of 1) Undergraduate Students of 16,561 items (68.94%), 2) Lecturers of 4,506 items (18.76%), 3) Graduate Students of 1,924 items (8.01%), 4) Officers of 677 items (2.82%), and 5) Outsiders of 353 items (1.47%).

Collections of the books consist of 1) General Collection of 18,568 items (77.30%), 2) Fiction of 1,115 items (4.64%), 3) Old Book Collection of 816 items (3.40%), 4) Islamic Collection of 571 items (2.38%), 5) Elementary Book of 325 items (1.35%), 6) Research/Thesis of 315 items (1.31%), 7) Serial of 186 items (0.77%), 8) ASEAN Collection of 112 items (0.47%), 9) Malay Study Collection of 46 items (0.19%), 10) American Corner of 36 items (0.15%), and Others total of 1,931 items (8.04%).

### B. Association Rules Analysis

Association rule mining was applied to the data with a support threshold of 5% and a minimum 50% confidence interval to find an association between users (undergraduate students and lecturers) books based on book borrowing records.

### *Undergraduate student*

Association rules between undergraduate students and collection of books were 5 rules, as shown in Table 2.

**Table 2. Association rules between undergraduate student and collection of books**

No	Premises	Conclusion	Support	Confidence
1	<i>Research Collection</i>	<i>General Collection</i>	4.0	64.80%
2	<i>ASEAN Collection</i>	<i>General Collection</i>	1.8	86.70%
3	<i>Old Book Collection</i>	<i>General Collection</i>	5.1	90.10%
4	<i>Southern Data Collection</i>	<i>General Collection</i>	4.5	97.00%

1) Rule 1: if users borrowed books of *Research Collection*, they borrowed books of *General Collection* with 64.80% confidence.

2) Rule 2: if users borrowed books of *ASEAN Collection*, they borrowed books of *General Collection* with 86.70% confidence.

3) Rule 3: if users borrowed books of *Old Book Collection*, they borrowed books of *General Collection* with 90.10% confidence.

4) Rule 4: if users borrowed books of *Southern Data Collection*, they borrowed books of *General Collection* with 97.00% confidence.

Association rules between undergraduate students and the contents of the books were 12 rules, as shown in Table 3.

**Table 3. Association rules between undergraduate student and content of book**

No	Premises	Conclusion	Support	Confidence
1	<i>Differential and developmental psychology [155], Conscious mental processes and intelligence [153]</i>	<i>Psychology [150]</i>	0.8	60.00%
2	<i>Analytical chemistry [543]</i>	<i>Organic chemistry [547]</i>	0.8	66.70%
3	<i>Conscious mental processes and intelligence [153], Psychology [150]</i>	<i>Differential and developmental psychology [155]</i>	0.8	70.60%
4	<i>Human anatomy, cytology, histology [611]</i>	<i>Human physiology [612]</i>	1.6	76.70%
5	<i>History, description, critical appraisal of more than two literatures [809]</i>	<i>Literatures of East and Southeast Asia [895]</i>	0.7	100.00%
6	<i>Biochemistry [572], Human anatomy, cytology, histology [611],</i>	<i>Human physiology [612]</i>	0.6	100.00%

1) Rule 1: if users borrowed books content of *Differential and developmental psychology [155]* and *Conscious mental processes and intelligence [153]*, will borrow *Psychology [150]* with 60.00% confidence.

2) Rule 2: if users borrowed books content of *Analytical chemistry [543]*, they borrowed books of *Organic chemistry [547]* with 66.70% confidence.

3) Rule 3: if users borrowed books content of *Conscious mental processes and intelligence [153]* and *Psychology [150]*, they borrowed books of *Differential and developmental psychology [155]* with 70.60% confidence.

4) Rule 4: if users borrowed books content of *Human anatomy, cytology, histology [611]*, they borrowed books of *Human physiology [612]* with 76.70% confidence.

5) Rule 5: if users borrowed books content of *History, description, critical appraisal of more than two literatures [809]*, they borrowed books of *Literatures of East and Southeast Asia [895]* with 100.00% confidence.

6) Rule 6: if users borrowed books content of *Biochemistry [572]* and *Human anatomy, cytology, histology [611]*, they borrowed books of *Human physiology [612]* with 100.00% confidence.

#### Lecturer

Association rules between lecturer and collection of books were 5 rules, as shown in Table 4.

**Table 4. Association rules between lecturer and collection of books**

No	Premises	Conclusion	Support	Confidence
1	<i>Old Book Collection</i>	<i>General Collection</i>	14.8	90.90%
2	<i>Research Collection</i>	<i>General Collection</i>	7.4	100.00%
3	<i>Southern Data Collection</i>	<i>General Collection</i>	4.9	100.00%
4	<i>Old Book Collection, Research Collection</i>	<i>General Collection</i>	2.0	100.00%
5	<i>Research Collection, Southern Data Collection</i>	<i>General Collection</i>	2.0	100.00%

1) Rule 1: if users borrowed books of *Old Book Collection*, they borrowed books of *General Collection* with 100.00% confidence.

2) Rule 2: if users borrowed books of *Research Collection*, they borrowed books of *General Collection* with 100.00% confidence.

3) Rule 3: if users borrowed books of *Southern Data Collection*, they borrowed books of *General Collection* with 100.00% confidence.

4) Rule 4: if users borrowed books of *Old Book Collection* and *Research Collection*, they borrowed books of *General Collection* with 100.00% confidence.

5) Rule 5: if users borrowed books of *Research Collection* and *Southern Data Collection*, they borrowed books of *General Collection* with 100.00% confidence.

Association rules between lecturer and content of book were 11 rules, as shown in Table 5.

**Table 5. Association rules between lecturer and content of book**

No	Premises	Conclusion	Support	Confidence
1	<i>Grammar of standard English [425]</i>	<i>Standard English usage (Prescriptive linguistics) [428]</i>	2.0	66.70%
2	<i>Literature of East and Southeast Asia [895]</i>	<i>Languages of East and Southeast Asia [495]</i>	2.0	66.70%
3	<i>Algebra [512]</i>	<i>Analysis [515]</i>	1.5	75.00%
4	<i>Analysis [515]</i>	<i>Algebra [512]</i>	1.5	75.00%
5	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808], Southeast Asia [959]</i>	<i>Languages of East and Southeast Asia [495]</i>	1.5	75.00%
6	<i>Southeast Asia [959], Languages of East and Southeast Asia [495]</i>	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808]</i>	1.5	75.00%
7	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808], Southeast Asia [959]</i>	<i>Literature of East and Southeast Asia [895]</i>	1.5	75.00%
8	<i>History, description, critical appraisal of more than two kinds of literature [809]</i>	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808]</i>	2.0	100.00%
9	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808], Languages of East and Southeast Asia [459]</i>	<i>Southeast Asia [959]</i>	1.5	100.00%
10	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808], Literature of East and Southeast Asia [895]</i>	<i>Southeast Asia [959]</i>	1.5	100.00%
11	<i>Southeast Asia [959], Literature of East and Southeast Asia [895]</i>	<i>Rhetoric and collections of literary texts from more than two kinds of literature [808]</i>	1.5	100.00%



- 1) Rule 1: if users borrowed books content of *Grammar of standard English* [425], they borrowed books of *Standard English usage (Prescriptive linguistics)* [428] with 66.70% confidence.
- 2) Rule 2: if users borrowed books content of *Literature of East and Southeast Asia* [895], they borrowed books of *Languages of East and Southeast Asia* [495] with 66.70% confidence.
- 3) Rule 3: if users borrowed books content of *Algebra* [512], they borrowed books of *Analysis* [515] with 75.00% confidence.
- 4) Rule 4: if users borrowed books content of *Analysis* [515], they borrowed books of *Algebra* [512] with 75.00% confidence.
- 5) Rule 5: if users borrowed books content of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] and *Southeast Asia* [959], they borrowed books of *Languages of East and Southeast Asia* [495] with 75.00% confidence.
- 6) Rule 6: if users borrowed books content of *Southeast Asia* [959] and *Languages of East and Southeast Asia* [495], they borrowed books of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] with 75.00% confidence.
- 7) Rule 7: if users borrowed books content of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] and *Southeast Asia* [959], they borrowed books of *Literature of East and Southeast Asia* [895] with 75.00% confidence.
- 8) Rule 8: if users borrowed books content of *History, description, and critical appraisal of more than two kinds of literature* [809], they borrowed books of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] with 100.00% confidence.
- 9) Rule 9: if users borrowed books content of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] and *Languages of East and Southeast Asia* [459], they borrowed books of *Southeast Asia* [959] with 100.00% confidence.
- 10) Rule 10: if users borrowed books content of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] and *Literatures of East and Southeast Asia* [895], they borrowed books of *Southeast Asia* [959] with 100.00% confidence.
- 11) Rule 11: if users borrowed books content of *Southeast Asia* [959] and *Literatures of East and Southeast Asia* [895], they borrowed books of *Rhetoric and collections of literary texts from more than two kinds of literature* [808] with 100.00% confidence.

## RESULT AND DISCUSSION

Association rule mining is used to determine the interesting relationship from the results of the data mining on library book borrowing records with a minimum of 60% confidence. The results show that each type of user borrows books differently; therefore, segmenting users prior to analysis will yield borrowing rules that correspond more precisely to the borrowing behavior of each type of user in accordance with Joshua et al. (2016) mentioned that the library is a source of all knowledge and learning and gathers a lot of data. However, association rule mining must be used to dynamically analyze the library database and make strategic decisions for efficiently managing the library.

The benefit of this study will be to know the user's book usage behavior, allowing administrators and library staff to know the trend of borrowing books that match the user's interests. In addition, administrators can use the results of the analysis to make decisions and formulate strategies for the procurement of information resources. (Soonthonwarapas et al., 2020), and in accordance with Rumdon et al. (2022) mentioned that the information from behavioral analysis can be used as the basis for organizing information services or reading promotion activities. However, the results of this analysis of the book usage behavior of users show that they are taking advantage of the book borrowing history,

which is considered to add value, and using the existing information to benefit the library's users efficiently.

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# Developing an Ontology for Thai Coffee Knowledge

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## ABSTRACT

The Thai coffee industry is an important sector of the economy, but it lacks a systematic and standardized knowledge representation, which hinders effective knowledge sharing and reuse among stakeholders. In this research paper, we presented a case study of developing an ontology for Thai coffee knowledge representation on the Semantic Web. The ontology aims to capture and represent the essential concepts, relationships, and attributes of the Thai coffee industry, including the Coffee Knowledge, Varieties, Coffee Growing Location, Cupping Score, Physical and Chemical, Coffee Processing, Yeasts, Lactic Acid Bacteria, Specialty Coffee, Coffee Defects, Coffee Brewing, Coffee Sensation and Roast Level. We used an ontology development methodology that involves knowledge acquisition, ontology development, and ontology evaluation. We also used software tools and technologies such as Hozo-Ontology Editor, RDF, and SPARQL to support the ontology development and testing. Our results show that the ontology is feasible, effective, and useful for Thai coffee knowledge representation on the RDF. The ontology provides a common vocabulary for the Thai coffee industry, which can improve knowledge sharing and reuse among stakeholders. The ontology also demonstrated the potential and relevance of ontology-based knowledge representation for the coffee industry, which can be extended to other domains and industries. Our research paper presents a valuable addition to knowledge management, and ontology development domains. Specifically, our study focuses on assisting coffee farmers by providing them with recommended processing techniques, as well as information on yeasts and lactic acid bacteria used in fermentation. The approach is based on extracting knowledge from best practices in the field, resulting in the design of an ontology that effectively supports coffee farmers in their decision-making process.

**Keywords:** Ontology, Thai coffee, Knowledge representation, Hozo, Knowledge modeling

## INTRODUCTION

The worldwide coffee supply relies on two main species, namely Arabica (*Coffea arabica*) and Robusta (*Coffea canephora*). Arabica accounts for approximately 55% of global coffee production, while

Robusta contributes around 45% to the total coffee production. These two species play a crucial role in meeting the global demand for coffee. In 2021 and 2022, shortfalls in global stocks of these two crop species led to a dramatic increase in the coffee price, which in the case of Arabica resulted in a short-term doubling of commodity prices (International Coffee Organization, 2022). Production shortfalls in the coffee industry were primarily linked to drought, such as the recent frost incidents in Brazil. Additionally, drought directly affected coffee-growing nations, leading to decreased production. However, it's important to note that other factors, including the COVID-19 pandemic, also played a role in the overall decline in coffee production (Davis et al., 2022).

The coffee industry is an important sector of the economy in many countries, including Thailand. Thai coffee has gained recognition in recent years for its unique taste and high quality. However, there is a lack of systematic and standardized knowledge representation in the Thai coffee industry. As a result, it is challenging for stakeholders such as farmers, roasters, exporters, and researchers to share and access relevant information effectively. This problem can be addressed by developing an ontology for Thai coffee knowledge representation on the Semantic Web.

The concept of the Semantic Web pertains to the vision of the Web of interconnected data proposed by W3C. It involves utilizing Semantic Web technologies to create data repositories, develop vocabularies, and establish rules for data management. These technologies, including RDF, SPARQL, OWL, and SKOS, enable the creation and linking of data on the web (W3C, 2015). The Semantic Web is a collection of ideas and technologies designed to give meaning to the vast amount of information on the Web. Its goal is to structure information in a way that machines can automatically process. The current non-semantic web, dominated by HTML-based content, poses challenges in finding relevant information and automating data consumption. Search engines often yield numerous matches with limited relevance and buried content. The Semantic Web addresses these issues through the use of unique identifiers (URIs) to represent concepts and their relationships. By associating concepts with hierarchical classifications using ontologies, the Semantic Web enables the inference of new information based on classifications and relationships (Ontotext, 2022).

Ontologies enable knowledge sharing and reuse by providing a common vocabulary for a particular domain, facilitating interoperability and semantic integration of heterogeneous data sources. In this research paper, we present a case study of developing an ontology for Thai coffee knowledge representation on the Semantic Web. The ontology aims to capture and represent the essential concepts, relationships, and attributes of Thai coffee knowledge, including the coffee Varieties, Coffee Growing Location, Cupping Score, Physical and Chemical, Coffee Processing, Yeasts and Lactic Acid Bacteria, Specialty Coffee, Coffee Defects, Coffee Brewing, Coffee Sensation, and Roast Level. We use an ontology development methodology that involves knowledge acquisition, representation, ontology development and evaluation, and DOCUMENTING Ontologies. We also use software tools and technologies such as Hozo-Ontology Editor, RDF, and SPARQL to support the ontology development and testing.

The contribution of this research paper is twofold. First, it provides a systematic and standardized representation of Thai coffee knowledge on the Semantic Web, which can improve knowledge sharing and reuse among stakeholders. Second, it demonstrates the feasibility and effectiveness of using ontology-based knowledge representation for coffee knowledge, which can be extended to other domains and industries. In the following sections, we review the relevant literature on Semantic Web, ontologies, and coffee industry knowledge management. We then present our materials and methods, results, and discussion of the ontology development and evaluation. Finally, we conclude with implications for practice and research, limitations, and future directions.

## LITERATURE REVIEW

Ontologies are a crucial topic in Computer Science, providing explicit conceptual models that allow the integration of domain knowledge into information systems. They are essential in the Semantic Web as they offer a semantic vocabulary for machines to understand website annotations. The study of ontologies draws from disciplines such as Artificial Intelligence, formal logic, automated reasoning, and Software Engineering. Ontologies also take advantage of web-based features and standards. Despite being a relatively recent field, significant progress has already been made, including the development of standardized ontology languages and the exploration of methodologies for ontology engineering. There are also emerging initiatives focused on linked open data and collaborative knowledge maintenance through ontologies. Web-based ontology technology finds practical applications in areas such as semantic search, information integration, question- answering, and web community portals (Grimm et al., 2011).

The utilization of ontologies for knowledge representation has gained considerable attention, particularly within the Semantic Web domain. Numerous studies have been conducted on ontology development methodologies, tools, and applications. For instance, Walls et al. (2019) conducted a study outlining the structure of an ontology and the design principles employed to create plant development stage terms. The research explained the methodology and reasoning behind modifying and extending the ontology to encompass development stages for all types of plants, with a specific focus on land plants ranging from bryophytes to angiosperms. As a demonstration of the general approach, the study examined gene expression variations during the developmental stages of Arabidopsis and maize embryos, utilizing the ontology to compare expression patterns across stages and between different species. Although several genes exhibited activity throughout embryo development, only a limited number of uniquely expressed genes were identified for each stage and between the two species. This analysis of different gene sets expressed during embryo development in Arabidopsis and maize may facilitate future research into the diverse developmental pathways observed in monocotyledonous versus dicotyledonous species. The Plant Ontology (PO) and its annotation database (<http://www.planteome.org>) make plant data more accessible and discoverable in standardized formats, supporting applications in plant pathology, image analysis, and comparative development and evolution.

Another study by Angelica & Ferdinand (2017) presented an expert system based on an ontology approach for analyzing different types of Arabica coffee beans. The system employed a simulation-based matching method using ontologies to assist coffee house entrepreneurs in selecting the most suitable coffee beans based on factors such as aroma, flavor, and sourness level. The objective of the study was to enhance the coffee business by providing a more efficient and accurate method for selecting coffee beans, ultimately leading to improved customer satisfaction and increased profits. The findings emphasized the potential of the expert system in optimizing the coffee selection process and its implications for the industry. The ontology approach was used to classify coffee beans by utilizing data properties such as aroma name, coffee bean name, dose name, flavor name, and sourness level name. The simulation-based matching method enabled coffee house entrepreneurs to input parameters like aroma, flavor, and sourness level to obtain matched coffee beans as outputs. The system was implemented using platforms such as Protégé, JESS, and SWRL. In a study conducted by Martinez et al. (2019), the focus was on investigating the impact of bacterial and yeast starters during the wet fermentation of coffee beans on the formation of volatile and organic acid compounds. The authors extensively discussed the selection of precursor compounds that act as flavor markers in this fermentation process. The research received funding from Brazilian agencies.

In conclusion, ontologies have gained prominence in Computer Science as they facilitate the integration of domain knowledge into information systems through explicit conceptual models. Their

crucial role in the Semantic Web lies in providing a semantic vocabulary that enables machines to comprehend website annotations. Drawing from disciplines like Artificial Intelligence, formal logic, and Software Engineering, ontologies leverage web-based features and standards to enhance knowledge representation, semantic interpretation, and decision-making processes. Their potential extends to diverse domains, including plant biology, coffee selection, and fermentation, demonstrating the wide-ranging applications of ontologies in enabling efficient and effective information management and understanding.

## **MATERIALS AND METHODS**

### **Materials**

The researchers reviewed the existing literature and information sources related to coffee knowledge and experts input and knowledge from Tea and Coffee Institute of Mae Fah Luang University, World Coffee Research (non-profit agricultural research organization registered in the state of California) and Specialty Coffee Association of Thailand. The primary objectives and functions of the Tea and Coffee Institute involve facilitating research in the areas of tea and coffee, as well as serving as a hub for collaborative efforts and networking related to tea and coffee research at both local and global levels. This is because we understand that research is a powerful means of uncovering knowledge and addressing challenges, ultimately contributing to the advancement of the tea and coffee industry in Thailand.

### **Methods**

In this research, we adopted three steps of ontological development as follows:

1) Knowledge Acquisition: Gather relevant information and knowledge on coffee from information sources.

2) Ontology Development Process: The study employed five steps of ontology development from Noy and McGuinness (2001) as follows:

2.1 Determine Scope: this study determined the scope of coffee Knowledge, varieties, basic information, harvesting methods, processing, yeasts & lactic acid bacteria in fermentations, specialty coffee, defect and brewing.

2.2 Enumerate Terms and Properties: the study listed the terms and properties of each class.

2.3 Define Class: there are 12 classes, namely Coffee Knowledge, Varieties, Coffee Growing Location, Cupping Score, Physical and Chemical, Coffee Processing, Yeasts, Lattice Acid Bacteria, Specialty Coffee, Coffee Defects, Coffee Brewing, Coffee Sensation and Roast Level. The details of the 12 classes are presented for each class in Table 1.

2.4 Define Properties of Classes: 1) Concept relationship: “is-a,” e.g., Arabica is-a Varieties. 2) Property relationship: “part-of” or “p/o,” e.g., Properties\_of\_Coffee is part-of a Varieties and 3) Attribute relationship: “attribute-of” or “a/o,” e.g. Varieties\_id and Varieties\_name are “attribute-of” a Varieties.

2.5 Create Instances: instances address examples; e.g., in a class of Varieties, if a coffee’s name is “Catimor,” the instance would be coffee: Catimor CIFC 7963-13-28.

We used ontology development software, Hozo, to formalize the conceptual model into a machine-readable format. This involves defining classes, properties, and relationships, and specifying their attributes and constraints.

3) Ontology Evaluation: To ensure the accuracy and consistency of the ontology in its portrayal of the coffee knowledge domain, it is imperative to subject it to validation and testing processes employing application-based ontology evaluation methods that are conventionally utilized in the realm of ontology development. Moreover, these methods should be verified by the participation of three ontology development experts.

**Table 1. List of main coffee Knowledge Classes/Concepts and their definitions**

<b>Class/Concept</b>	<b>Definition</b>
<i>Coffee Knowledge</i>	The process involved cultivating, harvesting, and processing coffee beans.
<i>Varieties</i>	The coffee varieties are diverse species of coffee plants that produce distinct flavors, characteristics, and physical attributes in the resulting coffee beans. These varieties are classified according to their genetic traits, origin, and specific growing conditions.
<i>Coffee Growing Location</i>	The geographical diversity of coffee growing locations adds to the richness and variety of coffee available to consumers worldwide.
<i>Cupping Score</i>	The standardized evaluation system used in the coffee industry to assess the quality and characteristics of coffee beans. It is a numerical rating that represents the overall sensory profile of the coffee, including its aroma, flavor, acidity, body, and aftertaste.
<i>Physical and Chemical</i>	The physical and chemical properties of coffee are crucial for coffee professionals, including roasters, baristas, and quality control personnel.
<i>Coffee Processing</i>	The methods employed to transform the harvested coffee cherries into the green coffee beans that are ready for roasting. The processing techniques can significantly impact the flavor, aroma, and quality of the final coffee.
<i>Yeasts and Lattice Acid Bacteria</i>	Yeasts and lactic acid bacteria (LAB) have significant roles in the fermentation of coffee, particularly in the production of specialty or natural processed coffees.
<i>Specialty Coffee</i>	The specialty coffee refers to high-quality coffee that meets specific standards of flavor, aroma, and overall quality.
<i>Coffee Defects</i>	The coffee defects are undesirable qualities or imperfections that can be found in coffee beans. These defects may arise at different points in the coffee production process, including cultivation, harvesting, processing, and storage.



<b>Class/Concept</b>	<b>Definition</b>
<i>Coffee Brewing</i>	The process of extracting the flavors, aromas, and compounds from ground coffee beans to create a brewed beverage. It involves several key elements, including water, coffee-to-water ratio, grind size, brewing time, and brewing methods.
<i>Coffee Sensation</i>	The experience and perception of the sensory aspects of coffee when consumed. It encompasses the various sensations and characteristics that are detected by the senses, including taste, aroma, body, acidity, sweetness, and aftertaste.
<i>Roast Level</i>	The degree to which coffee beans are roasted, which significantly impacts the flavor, aroma, and overall characteristics of the brewed coffee.

## RESULTS

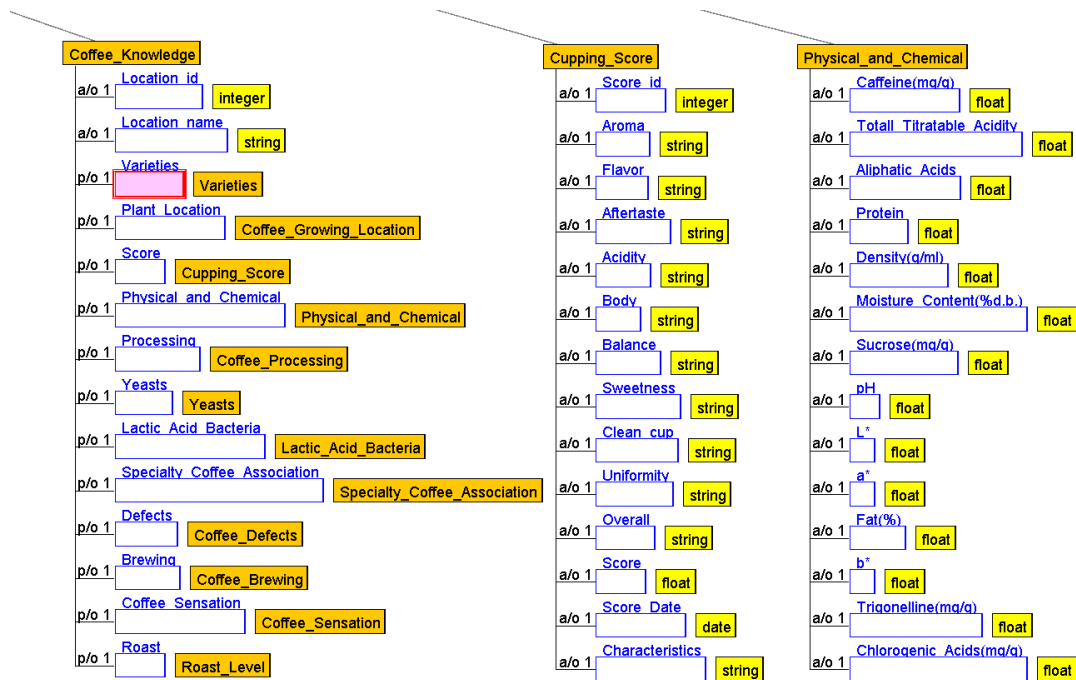
In the study, Thai coffee knowledge ontology was developed using Hozo, which is an ontology editor environment. Congruently, the scope of the ontology development was focused on coffee data and knowledge on Thai coffee.

The knowledge on Thai coffee ontology can be divided into 12 concepts. These include “Coffee Knowledge,” “Varieties,” “Coffee Growing Location,” “Cupping Score,” “Physical and Chemical,” “Coffee Processing,” “Yeasts and Lattice Acid Bacteria,” “Specialty Coffee,” “Coffee Defects,” “Coffee Brewing,” “Coffee Sensation,” and “Roast Level.” Also, one interesting aspect of the “Coffee Knowledge” class hierarchy (Figure 1) is the “is-a” relation of 2 important sub-class (“Coffee Growing Location,” “Cupping Score,” and “Physical and Chemical”)

The relations are found to consist of several types, including hierarchical relations such as “is-a,” “part-of,” and “attribute-of.” We specifically address these three formal relations in the study to indicate the specialization of the concept and sub-concept.

In addition, a class of “Coffee Knowledge” (Figure 1) is defined as a main class in the Thai coffee knowledge ontology with defined properties, i.e., “Location id,” “Location name.” Other main classes, as revealed in the study include the “Cupping Score,” “Physical and Chemical,” “Coffee Processing,” “Yeasts,” “Lactic Acid Bacteria,” “Specialty Coffee,” “Coffee Defects,” “Coffee Brewing,” “Coffee Sensation,” and “Roast Level” classes, which show an association with the “Coffee Knowledge” class.

## Coffee Knowledge



**Fig. 1. Class hierarchy of the Coffee Knowledge and properties of Cupping Score and Physical and Chemical class**

### Coffee varieties

Coffee comes in various varieties, each offering its own distinct flavor profile and characteristics. Here is a glimpse into some of the most popular coffee varieties:

1. Arabica coffee, originating in Ethiopia, started its global expansion in the 1700s. Initially, coffee varieties were predominantly derived from Typica and Bourbon lineages. However, in the 20th century, coffee breeders began incorporating "introgressed" varieties that offered resistance to coffee leaf rust. In more recent times, genetically diverse F1 hybrids have been introduced as well, further diversifying the coffee gene pool.

2. Robusta coffee has its origins in the forests of western sub-Saharan Africa and possesses a wide genetic diversity that contributes to its adaptability in various environments. The commercial cultivation of Robusta started in the Congo around 1870, and its production experienced rapid growth from the 1950s onwards, with Brazil and Vietnam emerging as major cultivators. Despite its long history in the wild, Robusta as a cultivated crop is relatively young. Consequently, both farmers and breeders are just beginning to tap into its extensive diversity and unlock its potential (World Coffee Research, 2023).

3. Liberica coffee, originally from upper West Africa, particularly Ghana, Liberia, and Sierra Leone, was introduced as a coffee crop plant in the 1870s. However, its cultivation and commercialization can be traced back to the early 1800s. During the late 1870s, Liberica gained prominence as a substitute for Arabica coffee in southern Asia, particularly in Sri Lanka, and Southeast Asia. This shift occurred due to the devastating outbreak and rapid spread of coffee leaf rust (*Hemileia vastatrix*), which posed a significant threat to Arabica coffee in those regions (Davis et al., 2022).

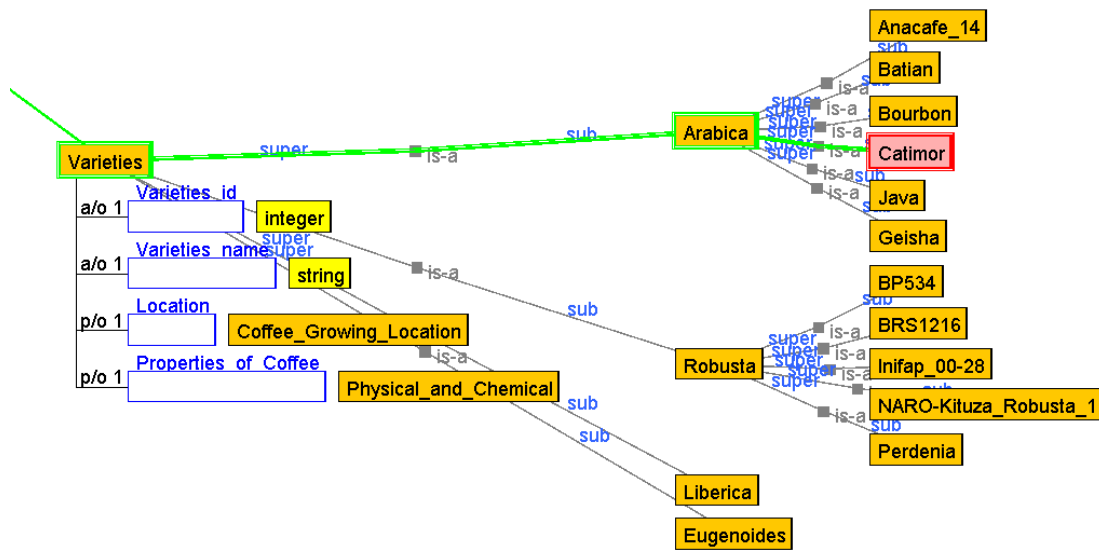


Fig. 2. Coffee varieties class

The Varieties class serves as a formal representation of knowledge and concepts pertaining to the different types or species of coffee plants, which impart distinct flavors, aromas, and characteristics to their coffee beans. This ontology incorporates a hierarchical structure, with "varieties" as the top-level concept. Further granularity is achieved through sub-concepts that represent specific coffee varieties, such as "Arabica," "Robusta," "Liberica," and "Eugenoides". Each variety concept is accompanied by a set of properties that provide detailed descriptions of its unique characteristics. These properties encompass various aspects, including the "Location" property, which delineates the geographic regions where the coffee plants are cultivated. Additionally, the "Properties\_of\_Coffee" property encompasses the specific physical and chemical attributes of the coffee beans associated with each variety and location, as illustrated in Figure 2.

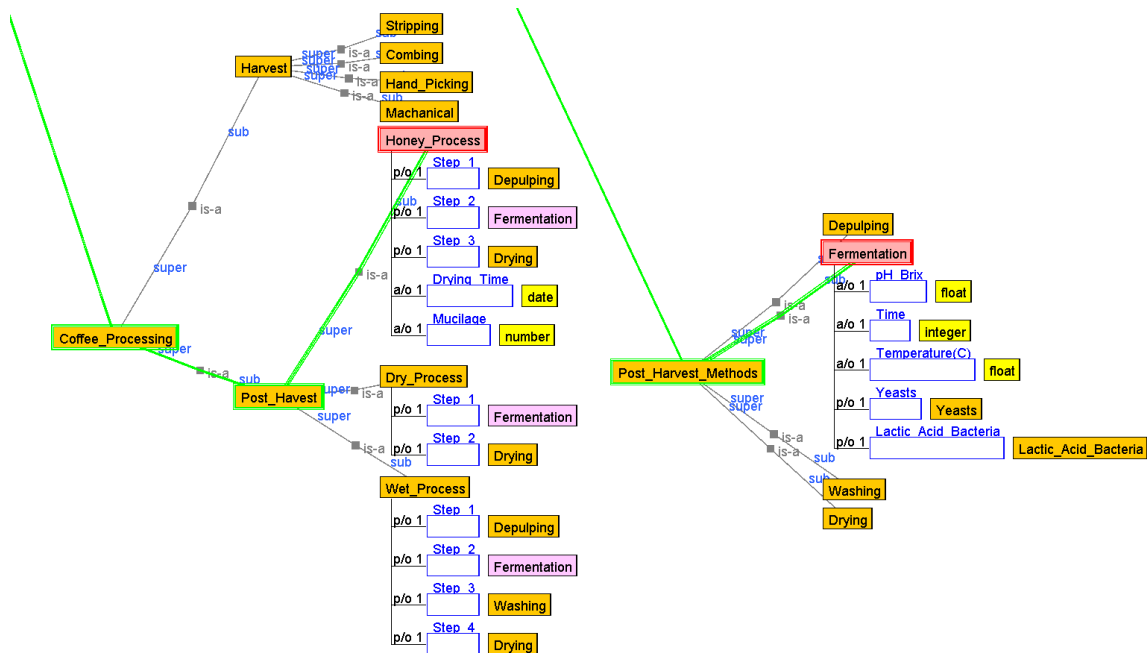


Fig. 3. Different methods employed to process coffee cherries class

## **Coffee Processing**

In the realm of coffee production, the Harvest and Post-Harvest methods delineate distinct stages in the processing of coffee.

**Harvest Method:** The Harvest category embodies the process of selectively gathering fully ripe coffee cherries from coffee plants. This encompasses various techniques such as stripping, combing, handpicking, and mechanical harvesting. The Harvest class serves as a higher-level concept, with subcategories nested within it.

**Post-Harvest Method:** The Post-Harvest category encompasses the procedures that follow the harvesting of coffee cherries, transforming them into green coffee beans prepared for further processing. Subcategories within the Post-Harvest class include the Wet Process, Dry Process, and Honey Process. These methods are connected to the stages of the Post-Harvest Method, which include:

**Depulping:** At this stage, the outer skin of the harvested cherries is removed to separate the pulp from the coffee beans.

**Fermentation:** During this phase, the coffee beans are soaked in water to eliminate any residual mucilage.

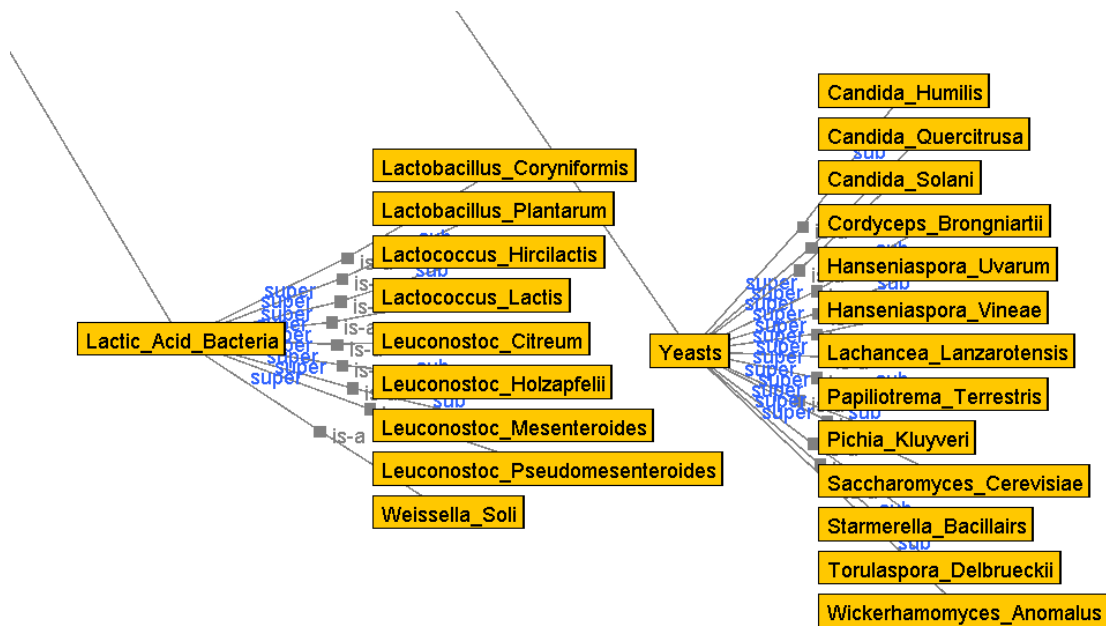
**Washing:** This step involves thorough washing of the fermented coffee beans to eliminate any residue or impurities.

**Drying:** In this stage, the coffee beans' moisture content is reduced through diverse methods such as sun-drying or mechanical drying.

By comprehending and categorizing these stages within the Post-Harvest Method class, professionals in the coffee industry can effectively manage and control the coffee processing, resulting in the desired quality and flavor profiles.

## **Yeasts & Lactic Acid Bacteria in Coffee Fermentations**

The process of fermentation involves the degradation of organic substances through the actions of various microorganisms. Among these microorganisms, bacteria and yeast play crucial roles in converting complex organic compounds into simpler forms. Within our ontology, we have established the Lactic Acid Bacteria class as the primary concept at the top level. This class encompasses sub-concepts like "Lactobacillus\_Coryniformis" and "Lactobacillus\_Plantarum," which represent specific types or species of lactic acid bacteria commonly involved in coffee fermentations. Similarly, the Yeasts class serves as another top-level concept, which includes specific yeast sub-concepts such as "Candida\_Humilis" and "Candida\_Quercitrusa," representing different yeast species associated with coffee fermentation, as illustrated in Figure 4.



**Fig. 4. Diversity of yeasts and lactic acid bacteria in coffee fermentation class**

### Specialty Coffee

The Specialty Coffee class in ontology represents the Specialty Coffee and encompasses knowledge and concepts related to the evaluation and classification of specialty coffee. It serves as the highest-level concept within the ontology hierarchy as illustrated in Figure 5.

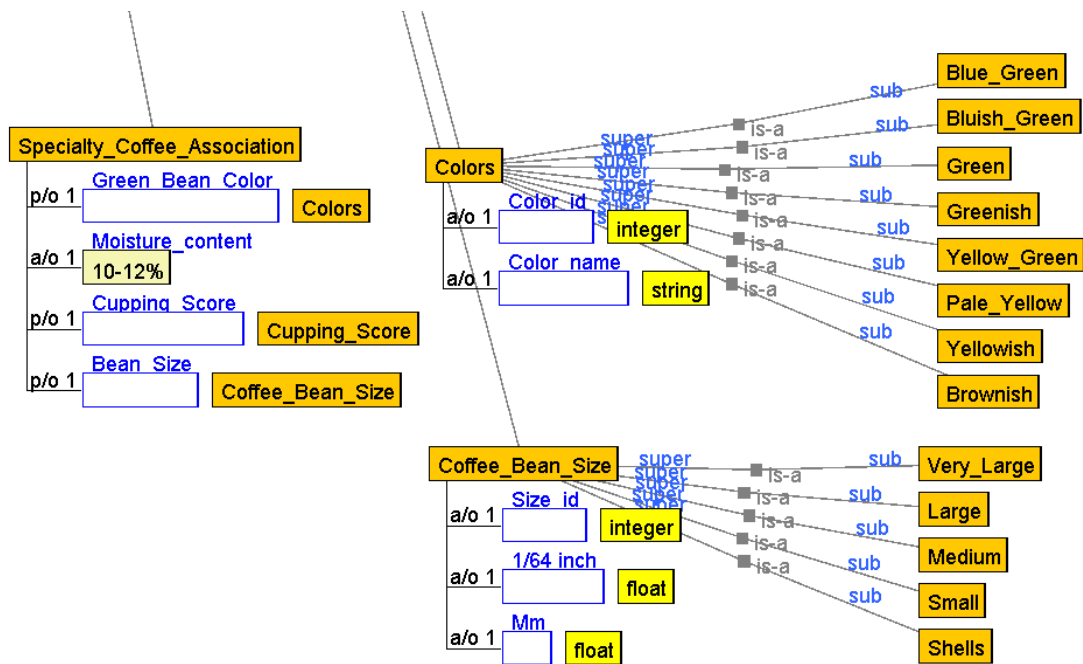
**Properties: Green Bean Color:** This property describes the color of coffee beans prior to roasting, encompassing variations in shade and appearance, ranging from blue-green to brownish.

**Cupping Score:** This property indicates the evaluation score assigned to a coffee during the cupping process, which assesses its sensory attributes and overall quality. Typically measured on a scale of 0 to 100, the cupping score reflects the excellence of the coffee.

**Bean Size:** This property refers to the size of coffee beans and their categorization into different grades or screen sizes. It captures details about the width of the beans and their classification based on size.

**Attribute: Moisture Content:** This attribute represents the level of moisture present in coffee beans, describing the amount of moisture retained within them. It influences factors such as quality, storage requirements, and flavor development during roasting.

Incorporating these properties and attributes into the class of the ontology provides a structured representation of knowledge and concepts relevant to the evaluation of specialty coffee. It enables coffee professionals to define and record information about the green bean color, cupping score, bean size, and moisture content of coffee. This facilitates quality assessment, classification, and decision-making processes within the specialty coffee industry.

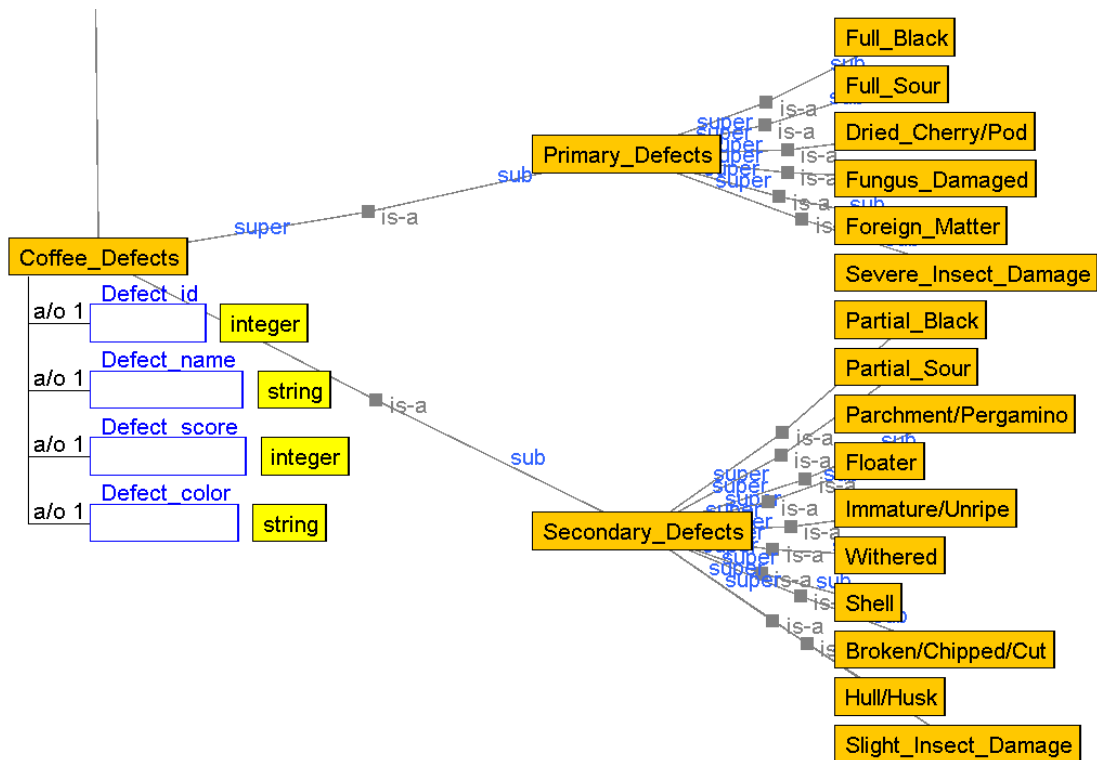


**Fig. 5. Concepts related to the evaluation and classification of specialty coffee**

### Coffee Defect

Coffee defects can be classified into two main categories: primary defects and secondary defects. The Primary Defects class in the Coffee Defects Ontology represents significant flaws that directly impact the quality and sensory characteristics of coffee. Within this class, there are sub-concepts such as "Full\_Black," "Full\_Sour," "Dried\_Cherry/Pod," and "Fungus\_Damaged," which specifically represent common primary defects found in coffee. These defects are considered major issues that render the coffee unsuitable for consumption or greatly diminish its overall quality. The ontology provides detailed descriptions of the characteristics and negative effects associated with each primary defect, facilitating quality evaluation and defect identification during coffee assessment.

On the other hand, the Secondary Defects class in the Coffee Defects Ontology encompasses less severe flaws that still have an impact on the quality and flavor profile of coffee to some extent. Sub-concepts such as "Partial\_Black," "Partial\_Sour," "Floater," and "Shell" are included in this class, representing specific secondary defects frequently observed in coffee. While secondary defects are not as critical as primary defects, they can indicate lower quality or less meticulous processing. The ontology captures properties that describe the characteristics and effects of each secondary defect, simplifying the process of evaluating quality and categorizing defects during coffee assessment. By incorporating the concepts of primary defects and secondary defects, the Coffee Defects Ontology provides a structured representation of knowledge and concepts pertaining to coffee defects. This framework enables coffee professionals to classify and evaluate the quality of coffee based on the presence and severity of these defects. Ultimately, it supports quality control efforts and assists in decision-making processes within the coffee industry as illustrated in Figure 6.



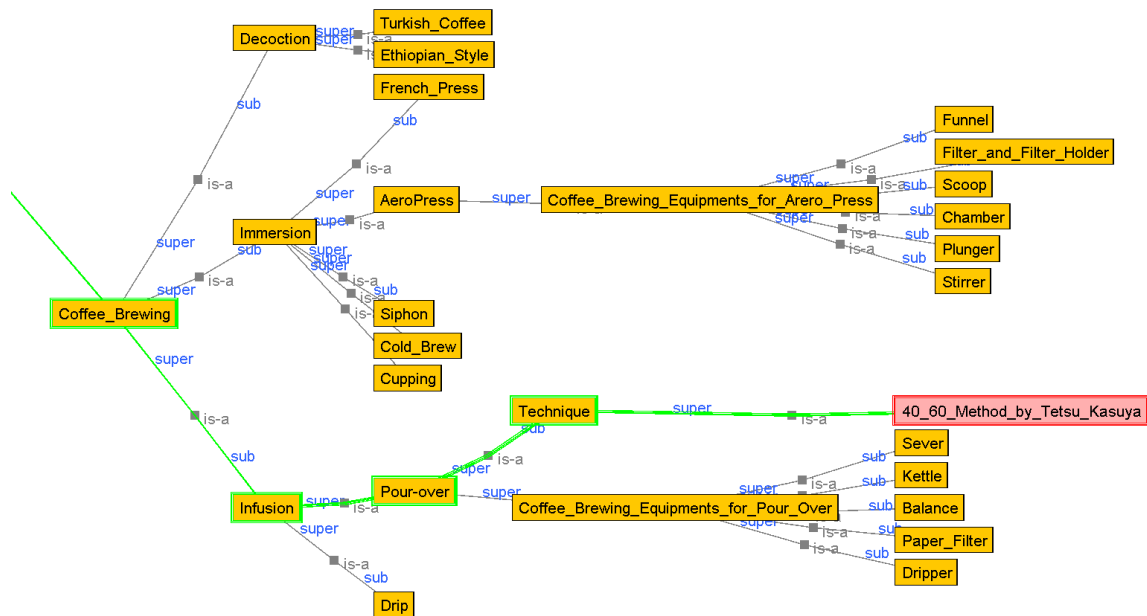
**Fig. 6. Coffee bean defects hierarchy**

### Coffee Brewing

Coffee brewing is the process of extracting the desirable flavors, aromas, and compounds from coffee grounds to create a delicious cup of coffee. It involves several key steps and considerations to achieve the desired taste and quality. The Coffee Brewing class encompasses various concepts, including Decoction, Immersion, and Infusion, which are subclasses of the broader concept of Coffee Brewing. Additionally, each brewing method is associated with specific equipment. The Decoction concept is a subclass of Coffee Brewing and represents a specific brewing method where coffee grounds are simmered in water for an extended period. This method is commonly observed in traditional Turkish coffee preparation and requires equipment such as a cezve (small pot). It is commonly associated with traditional Turkish coffee preparation.

The Immersion concept represents a brewing method where coffee grounds are fully immersed in water for a specified duration. This concept is exemplified by the popular French press method, where coffee grounds steep in hot water before being separated using a plunger. Infusion brewing is also used in methods like the AeroPress, where water and coffee grounds are mixed and steeped before being pressed through a filter. Infusion brewing involves pouring hot water over coffee grounds and allowing them to steep for a certain period. This method is commonly used in pour-over brewing, where water is poured in a controlled manner over the coffee grounds, allowing the water to extract the flavors as it passes through. The 4:6 Method is a revolutionary hand-drip formula invented by Tetsu Kasuya that won him the coveted title of the 2016 World Brewers Cup Champion.

By including these subcategories in the ontology of the Coffee Brewing class and connecting them with particular equipment, we establish a hierarchical framework that illustrates the connections between the brewing techniques and the tools employed in each method. This structure is visually depicted in Figure 7.



**Fig. 7. Concepts of Coffee Brewing classes**

In this study, we employed application-based ontology evaluation to assess the ontology of coffee knowledge. Correspondingly, the ontology can be evaluated using precision, recall, and the F-measure, as commonly employed in information retrieval. We assessed the performance of the system by computing three metrics: 1) precision, defined as the ratio of matched terms to the total number of identified terms; 2) recall, defined as the ratio of matched terms to the total number of terms manually found; and 3) the F-measure, which was calculated using a specific equation. The outcomes of the knowledge retrieval were demonstrated in the semantic search application to exhibit effective results in terms of precision (88.00%), recall (76.00%), and F-measure (79.00%). Furthermore, we conducted an evaluation of the ontology, which involved three ontology development experts. The evaluation criteria encompassed several aspects, including the definition of scope, objectives, classes and subclasses, properties, instances, and potential future applications. The evaluation resulted in an overall high-quality rating, reaching 91.00%. Moreover, the ontology was deemed suitable for the development of knowledge applications, particularly when utilized with a greater number of instances or real-world databases.

## CONCLUSIONS AND FUTURE RESEARCH

In conclusion, we present our coffee knowledge ontology, with a specific focus on the ontology development process. The development of an ontology can be delineated into three primary stages: knowledge acquisition, ontology development, and evaluation. Within the ontology development phase, a series of five steps are undertaken, including: 1) determining the scope, 2) enumerating relevant terms and properties, 3) defining classes, 4) specifying properties for these classes, and 5) creating instances to represent specific entities. The Hozo Ontology Editor was employed to facilitate the development of our ontology. Upon comparing our research outcomes to prior studies, it was found that the principal classes within the coffee knowledge ontology encompassed twelve categories: Coffee Knowledge, Varieties, Coffee Growing Location, Cupping Score, Physical and Chemical, Coffee Processing, Yeasts, Lattice Acid Bacteria, Specialty Coffee, Coffee Defects, Coffee Brewing, Coffee Sensation, and Roast Level.



The utilization of the coffee knowledge ontology will facilitate the creation of a Question-Answering System. This system will serve as a valuable resource for stakeholders in the Thai coffee agribusiness system, enabling them to produce high-value coffees. Additionally, it will assist scientists engaged in coffee research and its impact on human health, acting as a reference for selecting coffees of superior quality that retain beneficial substances. By doing so, it will help prevent any discrepancies in the outcomes of scientific research related to coffee.

## ACKNOWLEDGEMENTS

We would like to express my sincere gratitude to Dr. Amorn Owatworakit, Head of the Coffee Division at the Tea and Coffee Institute, Mae Fah Luang University, for his invaluable support in enhancing my knowledge about Thai coffee.

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# A Bibliometric Analysis of Cultural Resource Management: Research Trend from 1972-2023

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## ABSTRACT

History, cultural anthropology, archaeology, museum and cultural heritage studies all play a significant role in the extensive research on cultural resource management (CRM). This study attempted to provide a perspective on the present and future research in CRM by identifying the most significant authors, trends, and connections between various entities. To date, very few research has been investigated, still lacking in a comprehensive analysis on CRM-related topics at the global level. CRM in Thailand has also recently been studied. This paper therefore conducted a bibliometric analysis of CRM based on the indexed literature in Scopus from 1972 to 2023. It aimed at understanding the scholarly outputs volume, annual growth, collaboration research, co-occurrence and intellectual structure themes of CRM-based research sources extracted from Scopus. Bibliometric techniques were used to analyse 521 publications using VOSviewer 1.6.19 and R studio with Biblioshiny to visualise deep knowledge patterns of research themes. The University of Oxford produced the most output of CRM-related research. Findings of insight themes indicate that the future emphasis should be on CRM, archaeology, historic preservation and cultural heritage. The contribution of this paper is to help CRM scholars, practitioners and policy makers in making decisions and better understanding their future directions.

**Keywords:** Cultural resource management, Biblioshiny, VOSviewer, Bibliometric analysis

## INTRODUCTION

Cultural resource management (CRM) is now a global concern. It has been practiced, studied, and researched internationally. The CRM stakeholders encompass international organisations, federal/state agencies, academic institutions, private sectors as well as local and indigenous communities. Activities and discussions in CRM currently embrace technology, power relations, policy making, social inclusion, etc. As Knudson (1999) predicts, CRM in the twenty-first century is more driven by general concerns about quality of life. The purposes of this paper were to investigate and visualise the global overview in which CRM is developing. It also draws several conclusions that can be beneficial for developing Thailand's CRM practices and designing university curriculum in CRM, which could be

based on combined workshop series and implementation schemes in archaeological projects. By highlighting and discussing the pros and cons of the different knowledge domain and approaches in the literature, we hope to provoke new initiatives and encourage CRM scholars, practitioners and policy makers to better understand and make decisions on the future directions of CRM.

## LITERATURE REVIEW

### 1. Cultural resource management

This section discusses the definitions of cultural resource management (CRM)<sup>8</sup> and related terms. According to *Encyclopedic dictionary of archaeology* (Kipfer, 2021), cultural resources refer to tangible remains from the past, such as objects, landscapes, sites and structures that are culturally significant to communities (also see King, 2016; Knudson, 1999, for lists of cultural resources). CRM is defined as a sub-discipline of archaeology, which is interested in protecting and managing the past through legally mandated conservation and preservation of cultural resources (Kipfer, 2021). Starting in the United States, the CRM activities were based on environmental and archaeological preservation legislation, including the National Environmental Protection Act (NEPA), the National Historic Preservation Act (NHPA) and the Archaeological Resources Protection Act (ARPA) (Knudson, 1999). Thus, CRM projects in the US context have rather relied on federal and state agencies in managing cultural and ecological resources.

In the British context, the term ‘cultural heritage’ or simply ‘heritage’ is more commonly used than ‘cultural resources’. Therefore, CRM might be referred to as heritage management, cultural heritage management, or heritage resource management (see Cleere, 1989; Fairclough, 2008, for example). The term ‘heritage’ is in fact associated with international practice regarding protecting cultural resources. Cultural heritage was first referred to as ‘cultural property’, based on the UNESCO 1970 Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (1970), before becoming ‘cultural heritage’ (as opposed to ‘natural heritage’), based on the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage. In 2003, the Convention for the Safeguarding of the Intangible Cultural Heritage was signed, as the safeguarding of ‘intangible cultural heritage’ (ICH) had increasingly gained significant international attention (Akagawa & Smith, 2018; Kwasniewski et al., 2023; Mathioudakis et al., 2022; Samuels, 2015; Stephano & Davis, 2016).

In academic papers, ‘resource’ and ‘heritage’ are occasionally used interchangeably even though some scholars recognise their differences. McManamon & Hatton (2000), for instance, replaced the word ‘heritage’ with ‘resource’ in title of their edited volume *Cultural resource management in the modern world*<sup>9</sup>, partly because they disagreed with a rather narrow interpretation of ‘heritage’, as the reconstructed accounts of the past (Lowenthal 1996, cited in McManamon & Hatton, 2000). Despite that, the volume does not attempt to distinguish CRM from CHM. As McManamon & Hatton (2000) point out, there is a common ground that, cultural resources and ‘heritage’ include not only archaeological sites and remains, but also prehistoric and historic buildings, museum collections, historical accounts and living cultures, etc.

Furthermore, the concepts and practices regarding managing cultural heritage are simultaneously developed within other fields, such as heritage studies, museum studies and tourism; and each discipline

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<sup>8</sup> Another less common spelling of ‘cultural resource management’ is ‘cultural resources management’, such as in Fowler (1982).

<sup>9</sup> This volume was developed from the third World Archaeological Congress, following its preceding publication *Archaeological heritage management in the modern world* by Henry Cleere (1989).

has its own set of literature. The topics discussed in these fields include authenticity, interpretation, conservation, indigenous and vernacular culture, policymaking (McManamon & Hatton, 2000). Key themes found in recent literature include community engagement and multivocality (Baldrice et al., 2019; Bradran et al., 2022; Hutchings & La Salle, 2018; Praetzellis & Praetzellis, 2011) and technology (Knudson, 1999; Ingbar, 2019; Mathioudakis et al., 2022; Roper, 2019), aside from ecological and historic conservation (Casey & Becker, 2019; Knudson, 1999; Miksic et al., 2011; Schumann, 2019; Steeves, 2015; Teeman, 2008), in which CRM is rooted.

In the Thai context, cultural heritage is protected by the national legislation. In academia, CRM concerns both tangible and intangible cultural resources. This concept was first introduced by a well-respected archaeologist Thanik Lertcharnrit. His book on CRM (2016) covers a wide range of themes such as value and meaning of cultural resources, interpretation and communication, and sustainability in CRM. Thus, CRM in Thailand are not necessarily strict to archaeological preservation, but it shares interest with art, museum and heritage sectors at both conceptual and practical levels (Lertcharnrit, 2013).

While CRM is rooted in archaeological preservation in the US, it has been practiced internationally and continuously developed. To date, scholars have not yet reached an agreement of what CRM is; each has their own understanding, and not to mention that CRM keeps evolving. The activities and issues discussed in this field sometimes overlap with literature in other culture-related domains. There are in fact several recent bibliometric studies regarding cultural heritage (Chen et al., 2022; Vlase, I., Lähdesmäki, 2023). However, the concept of CRM is nowhere to be found, despite the overlapping interests. Therefore, this paper is interested in analysing the global trend of CRM research. This would enhance a better understanding of CRM as well as guiding CRM scholars where to position themselves in future research.

## **2. Bibliometric analysis of cultural resource management (CRM)**

A popular statistical technique to investigate the types, patterns, and impact of publications in the scientific community is a bibliometric analysis (Xie et al., 2021; Yang et al., 2022). Bibliometrics is a quantitative study that is relevant to mathematical and statistical evaluation, focussing on analysing the literature research direction or publication characteristics (White, 2018; Zhang, Ling & Lin, 2023). Due to the vast knowledge production, researchers in the field of cultural resource management started to explore the knowledge across regions and countries, using science mapping technique and bibliometric analysis (Ahmed Mohamed, Ahmad Zabidi Abdul Razak & Zuraidah Abdullah, 2020; Hallinger & Kovačević, 2021). However, there is no bibliometric research that provides insight into scientific direction research related to cultural resource management. Focussing on this topic, this paper therefore aims at investigating research trends in CRM:

- **RQ1:** What is the volume and annual growth by time of distribution in CRM research from 1972–2023?
- **RQ2:** What is the nature of collaboration that is evident in the research papers of CRM?
- **RQ3:** What are the most influential journals in CRM research?
- **RQ4:** What are the major themes that have been explored on the topic of CRM and how are they related?
- **RQ5:** What is the intellectual structure of knowledge base in CRM?

## METHODOLOGY

This paper conducted a bibliometric analysis of cultural resource management (CRM). The search for scientific literature was published on the Scopus database since 1972, which is trustworthy data with high-quality peer reviewed materials (Jimma, 2023). A total of 531 published documents were extracted over 50 years spanning on 6 May 2023. Table 1 summarises the process information which investigated documents in this study.

**Table 1. Process of bibliometric analysis of cultural resource management**

Bibliometric analysis of cultural resource management: Global research trends from 1972 – 2023		
Phrase 1 →	Phrase 2 →	Phrase 3
Search Area	Data Extraction and Software	Analysis and Interpret Data
Reliable Database: Scopus database	Microsoft Excel: Statistical analysis	Analysis 1) Document type
Search keywords: Cultural resource management, Cultural resources management	R Studio: Biblioshinny, R package, Performance analysis	2) Publication growth 3) Subject area 4) Contribution by country
Total publications: 531	VOSviewer 1.6.19: Knowledge mapping	5) Top source titles 6) Cited publication
Final selection: 521		7) Most used keywords 8) Citation metrics
Exclusion analysis: Language type: Spanish, Chinese, Arabic, Portuguese and Undefined		Science mapping: 1) Citation 2) Co-occurrence of keywords 3) Co-authorship
Inclusion analysis: Document type: Article, Review, Book chapter, Book, Conference review, Editorial, Conference papers and note.		

### 1. Search query and identification

The first step was to select the terms through a prior review. ‘cultural’ and ‘resource’ and ‘management’ were identified in terms of dataset in this study, derived from the SSCI (Social Sciences Citation Index). The following search query that was carefully design in the ‘Advance search’ interface of the Scopus database. TITLE-ABS-KEY ("cultural resource management" OR "cultural resources management") AND (LIMIT-TO ( LANGUAGE , "English" )). Therefore, the selection of the most appropriate source for a specific research field is an important step in the bibliometric data search. SSCI covers more than 531 journals in social science disciplines. Data retrieved from the Scopus database was used for data search in this study because it is the most scientific information and reliable index for use in a bibliometric analysis in the field of CRM (Hallinger, 2019).

### 2. Data extraction and cleaning

The identified documents were exported as comma-separated values (csv) files from the Scopus database. The first file contains all 531 entries found during the search, and then only “cultural resource

management” was selected. After refinement, the file contains comprehensive bibliometric information for the first 521 entries results with the most relevance.

### **3. Data analysis**

This study employs a quantitative data of bibliometric markers in its analysis to give readers a complete overall image and a perceptive interpretation. VOSviewer version 1.6.19. and the Bibliometrix R package were employed as two main tools for science mapping or data visualisation,. In particular, VOSviewer was utilised to carry out the mapping analysis of co-authorship or collaboration networks of authors and institutions, citation analysis, co-authorship among co-citation of cited authors, and keyword co-occurrence (van Eck & Waltman, 2017). Node and edges in the bibliometric networks are crucial for interpreting output data created by VOSviewer. However, to understand trend analysis, the illustration of growth of highly-cited documents and geographical distribution of these documents was produced in Microsoft Excel. The Bibliometrix R package was utilised to analyse significant indicators of CRM research, such as annual scientific growth, average article citation per year, sources publishing on CRM research, trending topic analysis, and thematic evolution in terms of conceptual structure. The keyword of co-occurrence analysis, a ‘thesaurus file’ was created and applied to cleansing out duplicate keywords. In this regard, the keywords ‘resources’ and ‘resource’ were found redundant. Thus, ‘resource’ was replaced with ‘heritage’, ‘history’ and ‘resources’.

## **RESULTS**

The results of bibliometric analysis of cultural resource management are discussed in this section. The results revealed volume and annual growth information, document contents, authors, authors collaboration and document types. The summary of analysis will be presented in the citation metrics for all 521 documents from 1972 to 2023.

### **1. Main information of volume and annual growth rates**

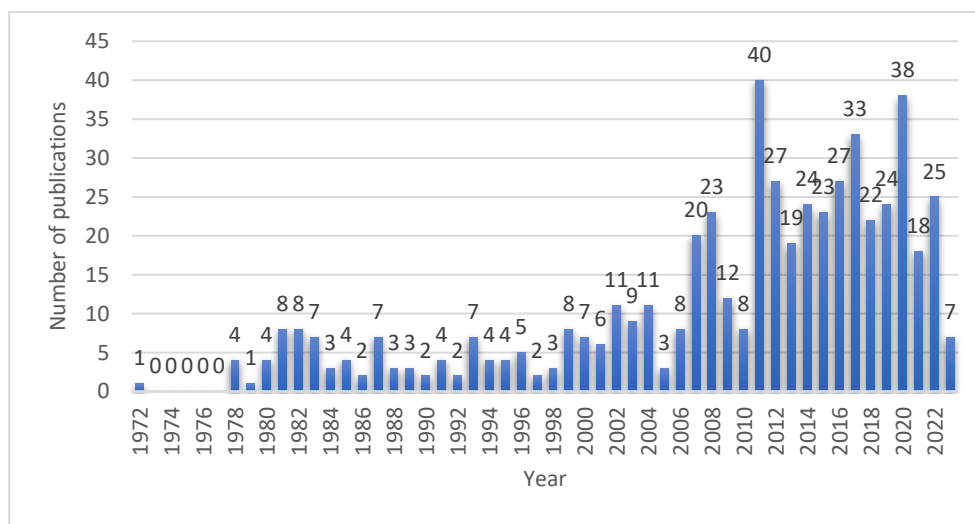
The 521 documents include eight types of documents among 268 sources. There are articles and review 336 documents or about 64.49% of the total documents. Of all documents, 298 documents (57.20%) are articles while 123 documents (23.61%) are book chapters. Other document types are reviews (38 documents or 7.29%), books (20 documents or 3.84%), conference reviews (2 documents or 0.38%), editorials (11 documents or 2.11%), conference papers (27 documents or 5.29%). The average number of citations per document is 8.85 and highly in references number 28,764 references. Table 2 presents the summary on CRM documents detail.

**Table 2. Summary of main information**

Description	Results	Description	Results	Description	Results
<b>Main information</b>		<b>Authors</b>		<b>Document types</b>	
Timespan	1978:2023	Authors	895	Article	298 (57.20%)
Sources (Journals, Books, etc)	268	Authors of single-authored docs	255	Review	38 (7.29%)
Documents	521	<b>Authors collaboration</b>		Book chapter	123 (23.61%)
Annual Growth Rate %	1.25	Single-authored docs	286	Book	20 (3.84%)
Document Average Age	13.5	Co-Authors per doc	1.95	Conference review	2 (0.38%)
Average citations per doc	8.85	International co-authorships %	10.56	Editorial	11 (2.11%)
References	28,764	<b>Document contents</b>		Conference paper	27 (5.29%)
		Keywords Plus (ID)	940	Note	2 (0.38%)
		Author's Keywords (DE)	1402		

**2. Number of publications**

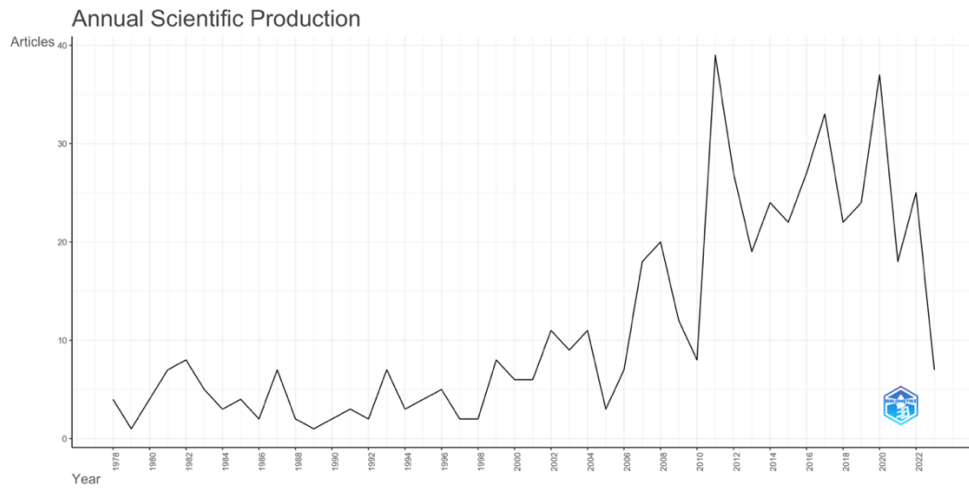
Figure 1 shows a slight increase in the number of publications. The first paper listed on the Scopus database was published in 1972 and authored by John M. Coles (1972). This document title is *Field archaeology in Britain* published in 1972. The book explained a practical guide to the various modern methods of discovery, excavation and recording of the remains left by prehistoric man in Britain. It was illustrated by bar graph, site plans and sections, and drawings and surveying procedures of knowledge in archaeology. Figure 1 presents the publications' increased scale from first published to 40 publications in 2012. The figures could be interpreted that the CRM topic has been studied over 50 years, and is likely to be an open-wide topic in the future.



**Fig. 1. Number of publications per year**

Figure 2 shows the annual growth of CRM research publications from 1972 to 2023 in Scopus database. It demonstrates a steady rise in research production since 1978. The annual growth rate (%)

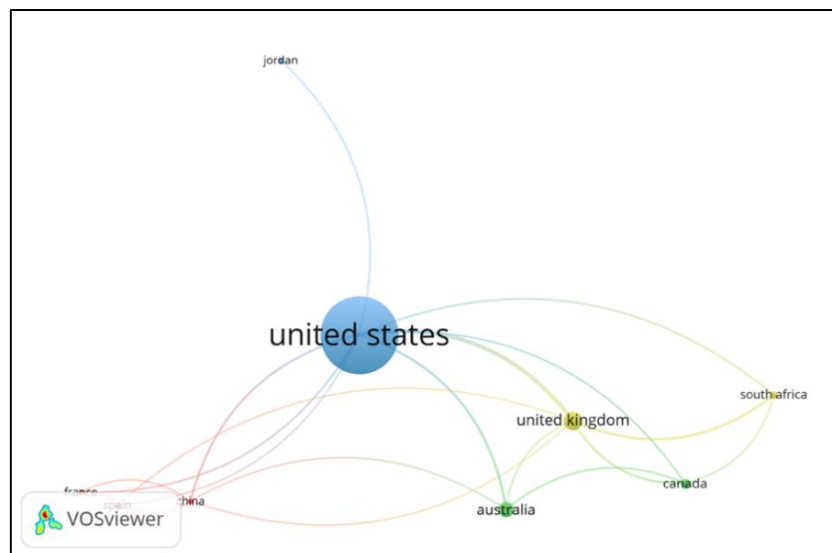
has an average of 1.25. The results also show an important number in annual citation of CRM from 2002 onwards.



**Fig. 2. Annual growth of CRM research publications by Scopus database (1978 – 2023)**

### 3. Collaboration among countries

In accordance with the research objectives, we examined not only the publication's global dissemination but also the type of collaboration that existed among the contributing nations. This bibliometric network demonstrating the level of collaboration between the nations is produced using VOSviewer and displayed in Figure 3. The USA is the strongest collaborator, with a total strength of 294 entries, according to the results, which is not surprising. The following excellent collaborators are the UK, Australia, Canada, South Africa, China, Jordan, Spain and France, respectively.



**Fig. 3. Collaboration among the countries**



#### 4. The influential journals

According to Research Question 3, the bibliographic coupling analysis was done to determine the most influential journals in the field of CRM. Of 268 sources, we chose to analyse all sources; and there were top journals met this threshold level. The results were ranked from highest to lowest of total publications, followed with substantial impact (H-index) in CRM. Table 3 illustrates the top 10 ranked most influential journals. Antiquity marked the highest ranking in the highest influential journal with 509 publications with highly H-index 85 (Q1). Others nine influential journals showed the result of total publication from 56 to 166 publications respectively.

**Table 3. List of top journals publishing in CRM**

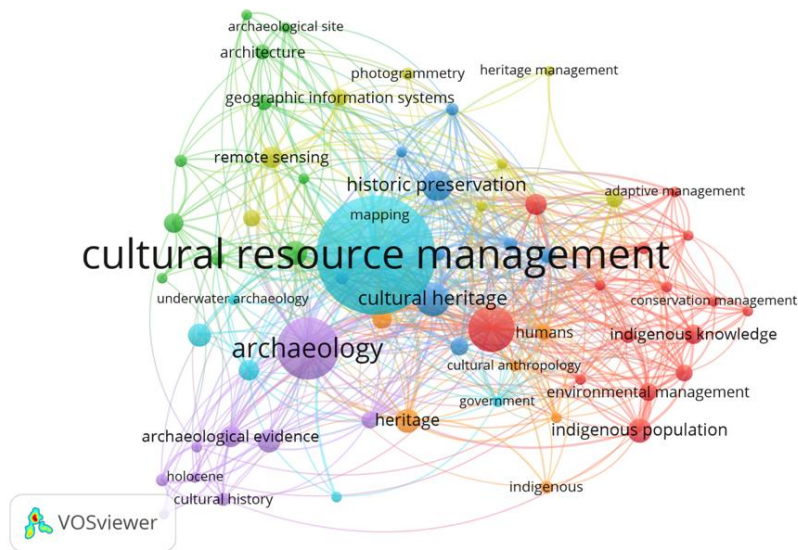
Rank	Source	Total publication (TP)	H-Index	SJR (2022)	SNIP	Quartile
1	Antiquity	509	85	0.95	1.251	Q1
2	American antiquity	166	85	1.28	1.757	Q1
3	Journal of field archaeology	162	43	0.83	1.802	Q1
4	Historical archaeology	145	26	0.38	0.876	Q1
5	Advances in archaeological practice	128	13	0.49	0.921	Q1
6	Annual review of anthropology	106	138	1.28	3.593	Q1
7	The kiva	87	24	0.22	0.301	Q1
8	Archaeologies	80	22	0.28	0.786	Q2
9	Plains anthropologist	61	21	0.46	0.800	Q1
10	Southeastern archaeology	56	26	0.5	0.637	Q1

#### 5. Trending major themes and key concepts

##### 5.1 Co-occurrence of keyword network

Regarding Research Question 4, many disciplines have used the co-occurrence of keywords theme to analyse the current research approach has been widely applied (Mao et al., 2020; Ohlan & Ohlan, 2022). We used VOSviewer to create a temporal network of author's key words to find the major themes that have recently drawn the attention of researchers. In addressing the research question, we conducted a keyword co-occurrence analysis to explore the key concepts in CRM. Finding commonly studied concepts provides a different perspective on conceptual structure of knowledge base within a respective boundary of data (Hallinger, 2020).

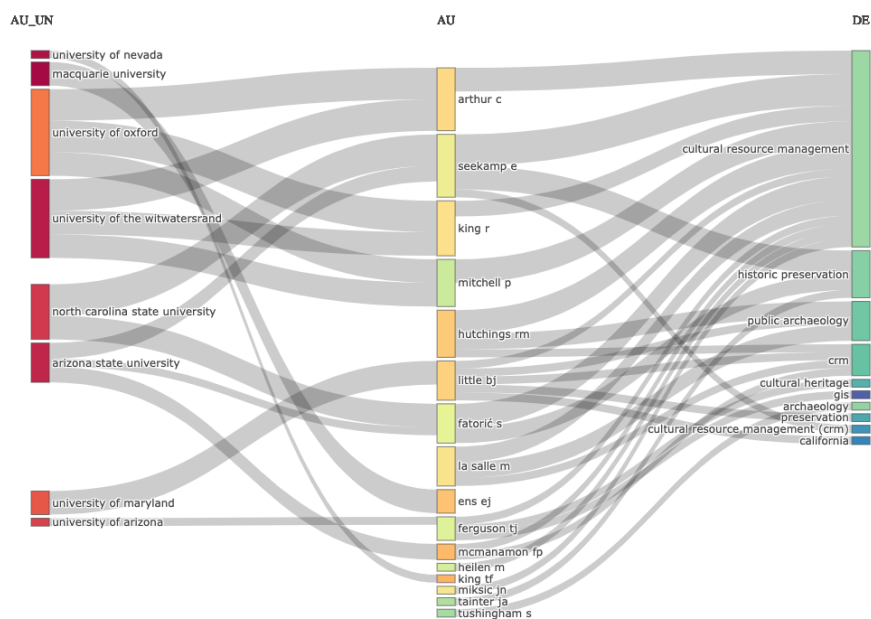
The final map is displayed in Figure 4, where the newest keywords are highlighted in blue circle. The size of the bubbles indicates the frequency of the term; the distance between bubbles shows the strength of the relationship; and the colour represents the major cluster (themes) of the key concepts. The network analysis has identified seven clusters of co-occurrences of keywords related to CRM, with archaeology and cultural anthropology being represented using various colours in the visualisation map. In Figure 4, the most appeared keywords happen to be CRM with 230 occurrences, followed by cultural anthropology (153), archaeology (150), resource management (130) and cultural heritage (85). Of the seven clusters that emerged from the analysis, the blue colour one is the most prominent cluster, mainly comprising the keywords related to CRM.



**Fig. 4. The keyword co-occurrence of author network visualisation in CRM literature in Scopus database**

### *5.2 Thematic scholars, institutes, and keyword plus*

In Figure 5, a Sankey diagram is used to illustrate a three-field plot in Biblioshiny, according to the research on CRM, focussing on relationships between author university, authors and author keyword. The visualisation represents of prolific scholars and identifies their universities where topics related to CRM have been studied. As shown in Figure 5, the left-most column represents active universities, the middle column shows authors' names contributing from their affiliations, and the right-most column represents the most used keywords by authors. The number of occurrences of these keywords forms what we refer to as the intellectual structure of knowledge base in CRM to answer Research Question 5. It is important to note the height of the boxes and the thickness of the connecting lines. Figure 5 indicates the highest outputs of universities as follow: the University of Oxford, the University of the Witwatersrand, North Carolina State University, Arizona State University, the University of Maryland, Macquarie University, the University of Nevada and the University of Arizona. These institutes examined fields related to cultural resource management, historic preservation, public archaeology, cultural heritage and archaeology. Most of the research on cultural resource management has been analysed using the author keyword.



**Fig. 5. Three-field plot for the relationships among author and university, author and author keywords in CRM using R package-Biblioshiny. (CR: Author Uni, AU: Author, DE: Document keyword)**

**DISCUSSION**

As mention previously, although the cultural resource management do not discuss much in bibliometric research but still appeared in archaeology trends. The above results enable us to understand a comprehensive historical overview of CRM through the volume and annual growth, the literature's global dissemination in the type of collaboration, the influential and knowledge domain on the research database which indexed on the Scopus. Therefore, we analysed the bibliometric approach. It can be concluded, first of all this might serve as a good basic knowledge for CRM researchs interested in determining in Southeast Asia to study advanced research in and moved beyond a phrase characterised by its. Second conclusion which can be explained the output of literatures increase since 2002 can be directly involved to the incorporation of Antiquity journal and after that the topic are widely covered by quite up a number of SSCI-indexed journals [Monteagudo-Fernández, J.; Gómez-Carrasco, C. J. & Chaparro-Sainz, 2021].

However, in Thailand found that scarcity publication in research database, this research could be a more effective way and energize scholars to target future CRM. Third conclusion attempts to understand research publications on CRM keyword network and keyword plus appears for analysis and interpretation which is based on a major cluster and intellectual structure of knowledge. The first, and most dominant is "cultural resource management" followed by "cultural anthropology" and "archaeology" while other dominants "cultural heritage", "historical preservation" and "archaeological evidence" can be found this day. Lastly, the University of Oxford have been made for long period and highest output. This is showing a long milestone from being achieved in the CRM field in Asia. One of scarcity of initiate idea and connections between different continents that allows for cross-collaboration and development.

Based on the findings, there has been ongoing international development in archaeological preservation research. Meanwhile, the discussion in this paper has some limitations. In the future, Thailand may benefit from the findings by expanding opportunities for both tangible and intangible

cultural resources in the museum and heritage sectors, both conceptually and practically in the Eastern region in Thailand. Lastly, the results provide certain reference value for scholars around the world who are interested in this field.

## CONCLUSION

To conclude, this paper used a bibliometric method to predict the research trends in CRM by analysing the most published papers and presented a data analysis perspective by visualisation for better understanding the discipline. The aims of this study were to investigate the research trends of cultural resource management (CRM) and to show the documents published from 1972 to 2023. In recent years, there has been a noticeable increase in interest in the research on CRM. The growing trend of annual publications rose and persisted in 2020, according to the evidence. The majority of the materials were journal articles. John M. Coles' work in 1972 was the first publication in ARCH Notes to be indexed in Scopus. The total number of documents on CRM were 521. The highest of document types were articles (298). The US produced the highest collaboration among countries with the number of publications of 294 entries on CRM. *Antiquity* stood top ranked in the highest influential journal with 509 publications with highly H-index 85 (Q1).

Findings also reveal trending major themes and key concepts, which are illustrated by the co-occurrence of keyword themes and a three-field plot using Biblioshiny. From the keyword co-occurrence map, it could be highlighted that the research trend in CRM is moving towards archaeology, cultural heritage and historic preservation. CRM is an increasing major research theme associated with history, cultural anthropology, archaeology, museum and cultural heritage studies. Regarding keyword plus, these results yield important insight into the significant relationships among author and university, and author and CRM within the umbrella of information science and CRM knowledge mapping.

With this paper as a starting point, we plan to be focussing on the development and integration of knowledge of information science and CRM in the future. In general, the pros and cons of the different knowledge domain and approaches shown in the literature help guide CRM scholars and practitioners where to position themselves, which areas of research and practice to focus on, as well as which directions to take in the future. In the Thai context, the insights on research trend gained from the study can be used by practitioners and policy makers to develop plans for CRM-related practices at the national level. With an understanding of emerging themes, Thai scholars and educators could also improve university curriculum on CRM, which might be based on combined workshop series and implementation schemes in archaeological projects, and develop the field in a way that is appropriate to the local setting while in line with the global trend. A further study on CRM of Thailand research, practice and education could be carried out, using a bibliometric analysis combined with qualitative methods such as documentary research and focus group discussion. That would help advance the discipline academically and professionally.

## ACKNOWLEDGMENT

This research is supported by Burapha University, as part of the first 'Preparation for Academic Title Application' Training Camp 2023.

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# Metadata Elements for Arranging Pagoda Data Description in Myanmar Library Management System

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## ABSTRACT

This paper explored the metadata elements necessary for both library users and library staff in managing pagoda data. It presented a systematic approach to examining metadata elements, existing standards, and user requirements. The primary objective of this study was to develop a comprehensive framework that incorporated metadata elements specifically tailored to pagoda data descriptions. Through a qualitative analysis, a suitable set of metadata elements for organizing pagoda data descriptions was identified. These metadata elements were essential for enhancing the discoverability and accessibility of pagoda data descriptions within the library management system, facilitating efficient search and retrieval processes. The findings of this study also served as a solid foundation for future implementations and enhancements in library systems, contributing to the preservation and wider dissemination of Myanmar's culturally rich heritage.

**Keywords:** Metadata elements, Pagoda data, Data descriptions, Myanmar libraries

## INTRODUCTION

Metadata plays a crucial role in organizing and providing access to information and resources within library systems. In Myanmar, pagodas hold significant cultural, historical, and religious sacred sites for worship and pilgrimage. Myanmar libraries have the responsibility of preserving and granting access to pagoda-related materials, including documents, photographs, artifacts, and scholarly works (Aye, 2020; Oo, 2018).

To accurately capture and describe the unique characteristics of pagodas, such as their architecture, historical importance, religious practices, cultural traditions and library needs, specialized metadata elements are required. By comparing and selecting appropriate elements, the goal is to incorporate them into the pagoda metadata schema, ensuring compatibility with established practices while addressing the specific requirements of pagoda data. Furthermore, this research will conduct a comparative analysis of existing metadata standards to identify those that align with the specific needs of pagoda data.

The purpose of this paper is to develop a comprehensive set of metadata elements specifically designed for creating a pagoda metadata schema in Myanmar libraries. The main objective is to establish a dedicated metadata framework that considers the unique characteristics of pagodas, including their religious and cultural significance, history, and architecture. Through a comparison of existing metadata standards, the paper aims to identify the most suitable standards for Myanmar pagoda data and incorporate them into the development of the pagoda metadata schema for use in Myanmar



libraries. The ultimate goal is to improve the organization and searchability of pagoda data, thereby enhancing access to these valuable cultural resources within the library context.

## LITERATURE REVIEW

Library management systems are essential tools for organizing and maintaining collections, including pagoda data, within libraries. These systems enable efficient cataloging, acquisition, circulation, and retrieval of information resources, ensuring effective management and access to pagoda-related data within library environments (Tochukwu & Henrieta, 2015). Museum registrars, librarians, and archival processors play a significant role in utilizing metadata within their industry. They employ metadata to arrange, describe, track, and enhance access to information objects. Metadata, as structured information providing context to data, facilitates effortless searching, browsing, and locating of pagoda data by incorporating vital details such as titles, authors, subjects, and descriptions (Beca, 2008).

Metadata standards play a crucial role in effectively organizing and describing pagoda information resources (Riley, 2017). Given the wide variety of available metadata standards, it is essential to compare and evaluate their respective elements and advantages. Through a comparative analysis, one can assess the strengths and weaknesses of each standard in meeting the specific requirements of historical pagoda data. This examination allows for informed decision-making regarding the selection and utilization of metadata standards that best suit the unique needs of pagoda-related historical data.

1. Dublin Core is a widely adopted metadata standard that offers a basic set of 15 elements for describing resources (Sugimoto et al., 2002). These elements include information such as title, author, date, and subject. While Dublin Core provides a simple and flexible framework, it is limited in capturing more detailed and specialized information related to pagoda historical data.
2. MODS (Metadata Object Description Schema) is an XML schema designed for descriptive metadata and is compatible with the MARC 21 bibliographic format. It provides 20 top-level elements, including title, name, typeOfResource, genre, originInfo, language, abstract, subject, classification, and more (Gartner, 2003). MODS offers a more extensive set of elements compared to Dublin Core, allowing for a richer description of pagoda-related historical data.
3. VRA Core (Visual Resources Association Core) is specifically developed for describing visual cultural objects. It consists of 19 elements, including work, collection, or image, agent, culturalContext, date, description, inscription, location, material, measurement, relation, rights, source, stateEdition, stylePeriod, subject, technique, textref, title, and workType (Eklund, 2007). VRA Core focuses on visual objects, it is suitable for describing pagoda-related historical data that includes visual representations such as pictures or artwork.
4. CDWA (Categories for the Description of Works of Art) is a set of best practices for describing various types of cultural works, including works of art, architecture, cultural material, groups of objects, and images (Harpring, 2022). It offers a comprehensive framework divided into three categories: Descriptive Metadata, Administrative Metadata, and Structural Metadata. CDWA provides detailed elements for capturing information related to works of art, architecture, and related entities, making it applicable for describing pagoda-related historical data that falls within these categories.

Multilingual and Cultural Considerations: Representing pagoda data poses challenges due to the distinctive terminology and script of the Myanmar language. To ensure inclusivity and accuracy, metadata schemas should incorporate multiple languages and cultural viewpoints. This allows for the description of pagodas in both the local language (Myanmar) and other languages relevant to the international user community. Incorporating cultural perspectives facilitates cross-cultural

understanding and improves access to pagoda information, promoting a more comprehensive representation of these cultural assets.

Integration with Linked Data Frameworks and Digital Preservation: metadata elements for pagoda data can be integrated with linked data frameworks and digital preservation programs. Linked data initiatives create interconnected networks of related resources by utilizing common identifiers and structured metadata. Integration with linked data frameworks enhances the discoverability and accessibility of pagoda data by establishing relationships with relevant sources, such as historical records, pictures, or scholarly publications. Furthermore, the use of metadata in digital preservation programs ensures the long-term availability and preservation of pagoda data in a digital setting, safeguarding it for future generations.

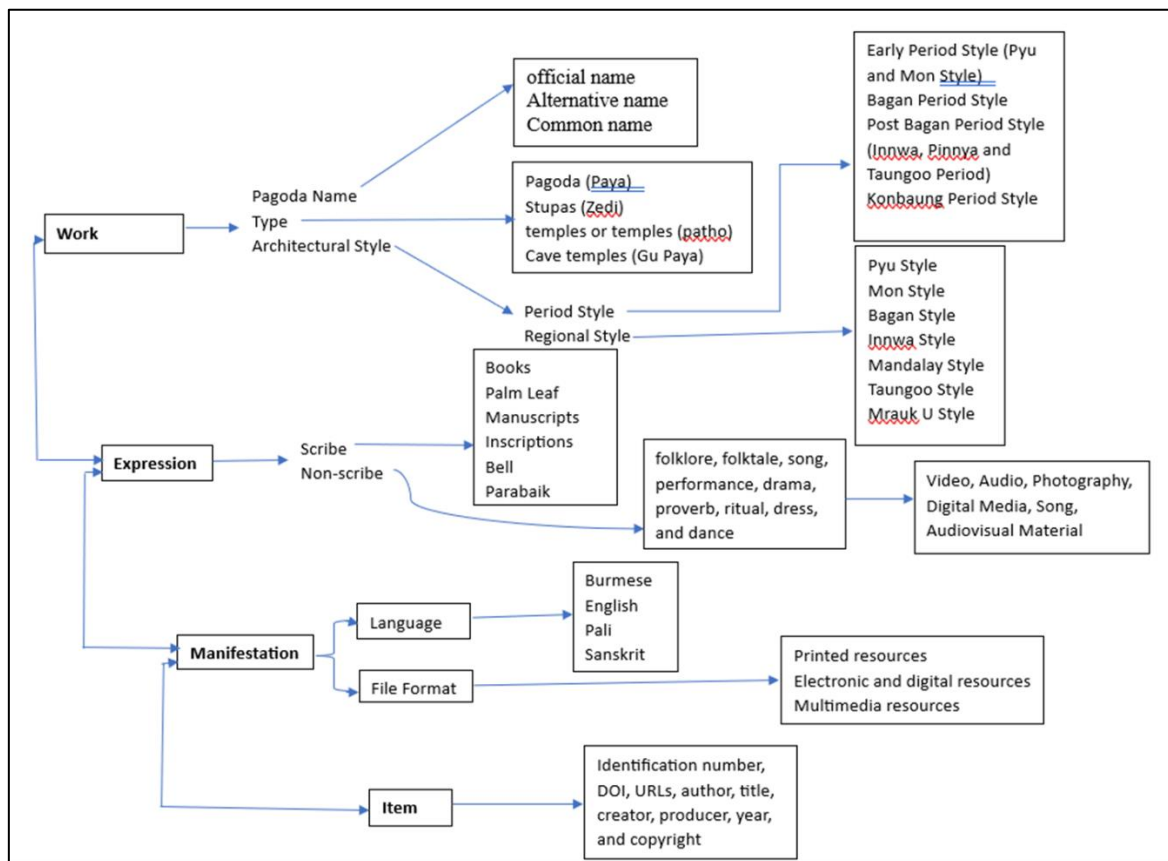
## **METHODOLOGY**

This study used a qualitative method to gather and analyze data on metadata elements for organizing pagoda data in a Myanmar library management system. Primary data was collected through a combination of observational studies, interviews, and surveys conducted at pagodas in Myanmar based on previous research. Secondary data was obtained from scholarly articles, books, reports, and existing databases. Content analysis was conducted to identify metadata elements, and a comparative analysis was performed to assess existing metadata standards. The study aimed to develop a comprehensive set of metadata elements tailored for pagoda data in the library system.

## **FINDINGS AND DISCUSSION**

### **4.1 Metadata Analysis of Myanmar Pagoda Elements with FRBR Model**

To accurately identify and describe the necessary metadata elements, the CDWA (Categories for the Description of Works of Art) metadata standards were utilized. In addition, adapting the user model and utilizing the FRBR (Functional Requirements for Bibliographic Records) model's four elements (work, expression, manifestation, and item) provided a comprehensive framework for analyzing various aspects of pagoda information and establishing relationships between them. The application of the FRBR model to Myanmar Pagoda elements allowed for the identification of different entities involved in metadata description and their interrelationships. This facilitates a more efficient and standardized arrangement of Pagoda data.



**Fig. 1. Analysis of Metadata Functions for Myanmar Pagoda Elements using FRBR Model Entities**

Figure 1 illustrates the FRBR (Functional Requirements for Bibliographic Records) model, which encompasses four levels of organization, namely Work, Expression, Manifestation, and Item. This model has been adopted in the management of Myanmar pagoda data and incorporates diverse metadata elements at each level. The FRBR model's four levels - Work, Expression, Manifestation, and Item - provided a hierarchical framework for organizing and managing pagoda information. The Work level focused on identifying and distinguishing between different pagodas, while the Expression level provided more detailed information about a specific pagoda. The Manifestation level specified the language(s) in which the pagoda information is presented and the format in which it is available, and the Item level included various types of resources related to a particular pagoda.

By applying the FRBR model to pagoda information, metadata elements can be organized and described in a way that facilitates the discovery, use, and management of the information. The Work includes elements such as Name, Location, and Period, which help to identify and distinguish between different pagodas. The Discovery element refers to the ways in which a pagoda can be searched for and found, such as by Name, Location, or Pagoda Related Resources. The Expression includes elements such as Pagoda Name, Location, Founding Year, Story, and History, which provide more detailed information about a specific pagoda. The Discovery element for this level is similar to the Work level, with search options based on Name, Location, Period, and Pagoda Related Resources. The Manifestation includes the language(s) in which the pagoda information is presented (Myanmar and English Language) and the document object that represents the physical or digital format in which the information is available. The Item includes various types of resources that provide information about the pagoda, such as text, book, research papers, electronic file, video, and image. This level allows for

the identification and access to specific resources related to a particular pagoda. In summary, the FRBR model's four levels provide a comprehensive framework for analyzing the different aspects of pagoda information and their relationships. By utilizing this model and including necessary metadata elements, resources can be described in a way that facilitates their discovery, use, and management, resulting in an improved user experience and greater satisfaction.

#### 4.2 Analysis of Existing Metadata Standards

The descriptions of Dublin Core, MODS, VRA Core, and CDWA metadata standards demonstrate their suitability for organizing pagoda data. These standards are highlighted, and a comparative analysis is conducted to evaluate their respective strengths and weaknesses in meeting the specific requirements of pagoda data metadata schema.

Table 1 compares the metadata elements of four different metadata schemas: Dublin Core, MODS, VRA Core, and CDWA. The table shows which elements are common to all four schemas, such as title, author/creator, and description, and which elements are unique to certain schemas, such as cultural context, inscription, and material. The table also includes elements that are important for specific types of resources, such as the type of resource for CDWA and the physical description for MODS. Overall, the table demonstrates the various options available for describing and organizing information using metadata and highlights the importance of choosing the appropriate schema for the specific resource being described.

**Table 1. Comparison of Data Elements in Metadata Standards; Dublin Core, MODS, VRA Core, and CDWA**

Metadata Elements	Dublin Core	MODS	VRA Core	CDWA
Title	✓	✓	✓	✓
Author/Creator	✓	✓	✓	✓
Subject/Keywords	✓	-	✓	✓
Description	✓	✓	✓	✓
Publisher	✓	-	-	-
Other Contributor	✓	-	-	✓
Date	✓	-	✓	✓
Resource Type	✓	-	-	✓
Format	✓	✓	-	-
Resource Identifier	✓	✓	-	-
Source	✓	-	-	-
Language	✓	✓	-	-
Relation	✓	✓	✓	✓
Coverage	✓	-	-	✓
Right Management	✓	-	-	✓
Type of Resource	-	✓	-	✓
Genre	-	✓	-	-
Origin Info	-	✓	-	-
Physical Description	-	✓	-	✓
Abstract	-	✓	-	-
Table of Contents	-	✓	-	-
Target Audience	-	✓	-	-

Metadata Elements	Dublin Core	MODS	VRA Core	CDWA
Note	-	✓	-	-
Classification	-	✓	-	-
Related Item	-	✓	✓	-
Location	-	✓	✓	✓
Access Condition	-	✓	-	✓
Part	-	✓	-	-
Extension	-	✓	-	-
Record Info	-	✓	-	-
Agent	-	-	✓	-
Cultural Context	-	-	✓	✓
Inscription	-	-	✓	✓
Material	-	-	✓	✓
Measurement	-	-	✓	✓
Rights	-	-	✓	✓
Source (References)	-	-	✓	-
StateEdition	-	-	✓	✓
Style Period	-	-	✓	✓
Subject (Generic terms)	-	-	✓	✓
Technique	-	-	✓	-
Textref	-	-	✓	✓
WorkType	-	-	✓	-

**Note:** "✓" means the metadata element is included in the standard, and "-" means it is not included

### 4.3 Comparing User Needs and Metadata Elements for Pagoda Data

Preceding research on the users' needs by the researchers identified the importance of including the pagoda's official name, as well as any alternative or similar names that users may search for, to enable users to locate the pagoda even if they were unfamiliar with its official name. The table presented in the following paragraph outlined the library and library users' needs for metadata elements, such as pagoda name, location, founding year, pagoda type, donor information, background story, characteristics, enshrined material, archeology, measurements, festival, conservation status, cataloging language, and multimedia. The table also discussed the existing metadata elements for each need and proposed additional elements, such as including contact numbers in the location information for easy access by visitors and donors. Furthermore, the paragraph emphasized the importance of providing data on Pali, Mon, or Pyu languages through photographs, along with images of Myanmar pagodas and inscriptions, as requested by users, and highlighted the essential information about building materials and techniques that may not currently be requested by library users but is necessary for researchers. To achieve consistency and standardization, it is important to use CDWA metadata that includes clear elements and sub-elements for easy categorization. Finally, the paragraph concluded by introducing Table 2, which compared the library users' needs to the existing metadata elements for Pagoda data.

**Table 2. Comparing Library User Needs and Existing Metadata Elements for Pagoda Data**

Library and Library Users' Needs	Existing Metadata Elements	Discussion
Name of pagoda (including any common or alternative names)	Pagoda name, similar name, and common name	<p>Contact numbers should be included in the location information for easy access by visitors and donors.</p> <p>Dates should be formatted as metadata because Burmese years are represented using both numerical and written characters</p>
Location of the pagoda	Location and contact address	
Founding year of the pagoda	Pagoda date	
Pagoda type	Type	
Donor information	Creation	<p>To meet user requests, it's important to provide data on Pali, Mon, or Pyu languages through photographs, along with images of Myanmar pagodas and inscriptions. Primary inscription data should be included in metadata without specific user request to serve both researchers and users. Information about building materials and techniques, which may not be currently requested by library users, is essential for researchers.</p> <p>Additionally, information about the pagoda preservation body and managing organization should be included in the metadata. To facilitate easier access, responsible bodies and building techniques, tools, and materials should be added to the metadata. To achieve consistency and standardization, it is important to use CDWA metadata that includes clear elements and sub-elements for easy categorization.</p>
Background story and history of the pagoda	Ownership/ Collecting history	
Characteristics and features of the pagoda	Physical description	
Enshrined material and decorated valuable jewelry, Buddha footprints and relics data and religious artifacts and practices of pagodas	Miracles	
Archeology and tourist attraction facts	Tourist attraction fact	
	Hierarchical relationship type	
Measurements	Measurements	
	Dimensions date and shape	
	Material/Techniques	
	Material color	
Festival	(Context) Festival	
	Architectural context	
	Style/Period	
Conservation status of the pagoda	Conservation/Treatment history	
	Treatment type, Treatment agent, Treatment date, Earliest date, Latest date, Related visual things (Mural)	
	Inscription author, Inscription location, Inscription language, Inscription date	
Cataloging language (Myanmar and English)	Cataloging language	
	Related person/Corporate body	
	Related textual reference	
Multimedia	Image and video	

In order to effectively manage Pagoda data, it is crucial to design metadata elements that accurately capture its specific characteristics in Myanmar. This involves considering the unique content, context, and structural components (Gilliland, 2016) of Pagoda data, while also taking cultural and religious aspects into account (Table 3). The goal is to facilitate the discovery, use, and management of Pagoda data through the incorporation of these specific elements.

**Table 3: Myanmar Pagoda Content, Context, and Structure Components**

<b>Module</b>	<b>Elements</b>
<b>Content</b>	Pagoda Structure (Size, Shape), Buddha image and other related statues, Related things, Inscription, mural, replica pagoda or Buddha image
<b>Context</b>	Name, Pagoda founding date, renovation and preservation date, collapsed date, Creation, Creator, Style/ Period, Measurements and Historical Dimension, pagoda color, Type and History, arts and architecture, Festival, Location and Contact Address, Ownership, History, Descriptive Note, Related History, physical description, miracle and tourist attraction facts, Inscription Language, Responsible Body
<b>Structure</b>	Physical Description (Body Design), Descriptive Note Text, Abstract, Conservation/ Treatment History, Related History and Reference

## CONCLUSION

The findings of this study led to the identification of metadata elements that aligned with CDWA (Categories for the Description of Works of Art) metadata standards. Additionally, the inclusion of photographs and videos of the pagodas suggested the use of VRA Core (Visual Resources Association Core) metadata standards. However, it was important to consider additional elements to ensure a comprehensive metadata schema for Myanmar pagodas. This study contributed to the field by providing a framework for developing a metadata schema specifically tailored to Myanmar pagodas. Future research should focus on the practical implementation and integration of the developed metadata schema into library management systems for pagoda data descriptions. Additionally, further studies can be conducted to assess the effectiveness and efficiency of the developed metadata schema in improving the discoverability and accessibility of pagoda data descriptions.

## RECOMENDATION AND SUGGESTION

Based on the findings of the study, the following recommendations and suggestions are proposed:

(1) **Conduct Regular Feedback Sessions and Interviews:** To ensure that the metadata schema for pagoda data effectively meets user needs, it is crucial to engage in regular feedback sessions and interviews. These sessions provide an opportunity to gather insights and gain a deeper understanding of user perspectives regarding the metadata schema. By actively involving library users and staff in interviews, their viewpoints and suggestions regarding the metadata schema can be better understood, enabling necessary improvements to be identified and implemented.

(2) **Foster Collaboration among Libraries, Cultural Institutions, Researchers, and Government Bodies:** To promote a unified platform for preserving and sharing Myanmar's cultural heritage, it is highly recommended to encourage collaboration among libraries, cultural institutions, researchers, and government bodies. This collaborative effort can involve the establishment of a dedicated shared repository or network specifically tailored to pagoda data and other cultural artifacts. Such a repository would facilitate the exchange of metadata, resources, and expertise among stakeholders. By expanding

the scope of the repository to include touchable and untouchable artifacts, it can provide a comprehensive platform for researchers, scholars, and enthusiasts to access and contribute to the preservation and understanding of Myanmar's diverse cultural heritage.

## ACKNOWLEDGEMENTS

I am grateful to the Department of Information Science, Faculty of Humanities and Social Sciences, Khon Kaen University, Thailand, and the CLMV Scholarship Program for their generous financial support, enabling the completion of this research.

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# Current Situation of Cultural Capital Information Utilization and Management

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## ABSTRACT

The aim of this study was to examine the utilization and management of cultural capital information within local administrative organizations. A qualitative research approach was employed, utilizing purposive sampling to select executive and cultural specialists from a local government institution. Data collection involved interviews, and content analysis was used to analyze the collected data. The findings revealed the existence of three types of cultural capital information within local government organizations: intangible, tangible, and administrative cultural capital information. These types of information are utilized for various cultural activities, including planning, project implementation, conservation, and dissemination. Cultural personnel are responsible for managing the information, which entails activities such as collection, storage, organization, maintenance, and utilization. However, several issues were identified, including a lack of professionals with expertise in culture and cultural capital information management, inadequate management technology, and a lack of clear policies for managing cultural capital information. The findings emphasize the need for improvement to enhance efficiency and ensure that it serves as a valuable resource for future development in other domains.

**Keywords:** Cultural capitals, Information use, Information management, Local administrative organizations

## INTRODUCTION

Cultural capital refers to a type of social capital that encompasses both tangible and intangible cultural assets. Tangible cultural capital comprises physical entities such as archaeological sites, architectural complexes, monuments, sculptures, paintings, manuscripts, and other valuable cultural artifacts that can be assessed in monetary terms. On the other hand, intangible cultural capital encompasses aspects such as oral traditions, performing arts, social customs and practices, rituals and festive events, as well as knowledge and practices related to nature and the universe. These forms of cultural capital contribute to the richness and diversity of a society's cultural heritage (Department of Industrial Promotion, 2016). In the 20-year National Strategic Plan (2018-2027), the Thai government places great importance on the continuous strengthening of cultural capital. A strategic focus in building confidence among participants involves the processes of requesting, upgrading, and reviewing various aspects based on three key ideas: 1) Building on the past, 2) Improving the present, and 3) Creating new values for the future (Strategic Transformation Office, n.d.).

Regarding the study of important community management tasks within local government organizations, it was identified that the missions related to local wisdom are also vital in community

management. However, there are several challenges encountered in the management of local government organizations regarding the use of information as follows:

1) Local government organizations possess information; however, much of it is basic operational data that lacks detailed spatial information, is not entirely accurate, and may not be up to date. Furthermore, local government executives currently do not have direct access to this information.

2) Local government organizations still face a shortage of knowledgeable personnel and expertise in organizing information systems and managing data effectively.

3) The information systems employed by central agencies are locally developed, lacking flexibility and consistency with the systems used by local government organizations. This leads to discrepancies between various data points and the actual data in the local area.

4) Insufficient availability of information systems and spatial data pose challenges for local government organizations.

5) Local government organizations frequently receive requests for information from external agencies, placing an additional burden on them to provide such information (Jinda, P., 2015). These issues, combined with the aforementioned problems, increase the risk of losing crucial information, including historical records and cultural wisdom. These challenges may hinder users' effective access to cultural capital information.

Therefore, it is essential to investigate the current state of utilizing and managing cultural capital information within local government organizations. The study incorporates information management concepts, ranging from demand determination to procurement, organization, storage, dissemination, and information services. The aim is to develop guidelines for the management of cultural capital information that is valuable, maximizes benefits, and caters to the future information needs of users.

## **LITERATURE REVIEW**

Based on the research concept, the study incorporates theoretical frameworks and relevant research related to Cultural Capitals, Cultural Heritage, and Cultural Heritage Informational, as follows:

### **Cultural Capitals**

The concept of cultural capital, as proposed by French sociologist Bourdieu (1986), suggests that cultural capital is accumulated in individuals, objects, and institutional forms. It is shaped and transmitted as a legacy through the education system. The accumulation of cultural capital produces distinctions and acts as a tool for maintaining social class existence. Grisworld (2004), a scholar in social sciences and cultural studies, expands on Bourdieu's concept by explaining that culture can be seen as a form of capital that can be accumulated and invested, just like economic capital. Cultural capital influences perceptions of cultural tastes and ways of life, considering it as an accumulation of capital that leads to the perception of influential power in society.

Bourdieu (1986) identified three forms of cultural capital: embodied, objectified, and institutionalized. Embodied cultural capital includes aspects such as language, mannerisms, and personal preferences. Objectified cultural capital refers to cultural goods, books, and works of art. Institutionalized cultural capital encompasses qualifications and educational credentials.

### **Cultural Heritage**

Cultural heritage refers to the tangible and intangible assets that are part of the collective property of a group or society and have been passed down through generations. It represents the legacy and cultural identity of a community, although not all aspects may be inherited from previous generations (Logan, 2007).

Tangible cultural heritage includes physical entities such as buildings, monuments, landscapes, publications, works of art, and artifacts. These are concrete manifestations of cultural heritage. Intangible cultural heritage, on the other hand, comprises intangible elements like folklore, traditions, language, knowledge, and natural heritage. It also encompasses culturally significant landscapes and biodiversity (Sullivan, 2016).

UNESCO classifies cultural heritage into two main categories: tangible cultural heritage and intangible cultural heritage. Within tangible cultural heritage, there are movable cultural heritage items such as paintings, sculptures, coins, and manuscripts, as well as immovable cultural heritage items like monuments and ancient sites. Underwater cultural heritage includes shipwrecks, underwater ruins, and submerged cities. Intangible cultural heritage encompasses oral traditions, performing arts, rituals, and other intangible practices (UNESCO, n.d.).

### **Cultural Heritage Information**

Cultural heritage information (CHI) encompasses all the information related to cultural heritage itself, including its name, concept, size, material, creator, place of production, and management. It covers various aspects such as conservation, movement, exhibitions, research, and the administration of cultural heritage institutions. CHI represents a valuable information resource that includes ancient documents, archival records, historical records, manuscripts, photographs, ancient maps, and movies. This information needs to be stored, organized, described, and provided with services. It requires protection and preservation to ensure the passing down of heritage from one generation to another (Chaichuay, 2017).

The classification of cultural heritage information can be based on the conceptual framework of museum information. This framework divides CHI into three types as follows (Reibel, 2008 cited in Chaichuay, 2017; Sander & Perkins, 1999;): (1) Collections information: It comprises information about cultural heritage objects such as museum artifacts, archives, and rare books. (2) Technical information: This category includes information and evidence related to technical activities concerning cultural heritage, such as conservation, exhibition, and research. (3) Business information: It encompasses information and evidence about the cultural heritage institutions responsible for the maintenance and administration of artifacts. This includes policies, program activities, audience statistics, finances, personnel management, names, addresses, donors, members, advisory committees, institutional communications with other agencies, and more.

## **METHODOLOGY**

This study is conducted as part of a larger research project focused on community information systems aimed at managing cultural capital for sustainable development. It serves as a preliminary investigation to gain insights into the utilization and management of cultural capital information within local government organizations. The primary objective of this study is to collect information, identify problems, and gather specifications necessary for designing the system in the subsequent phase of the project. To achieve this, a qualitative research approach is employed, encompassing the following steps:

### **Research site**

The selected research site for this study is Roi Et Province. Roi Et is a historically significant region known for its ancient communities that have nurtured rich cultural roots over time. The province boasts a wide range of cultural capital and local wisdom, encompassing both tangible and intangible forms.

The provincial development policy of Roi Et places a strong emphasis on leveraging culture to generate value. The Roi Et Provincial Development Plan for the period 2023-2027, aims to position Roi

Et as a smart agricultural city, foster creative tourism, unlock the value of its cultural heritage, and promote sustainable development within the society. The plan focuses on harnessing the potential of cultural assets to drive economic growth, enhance tourism experiences, and ensure long-term sustainability in the province.

### **Unit of analysis**

The study will utilize an organization-level analytics unit, specifically focusing on local government organizations that have cultural missions. These organizations include provincial administrative organizations, municipalities, and sub-district administrative organizations. The sampling method employed will be purposive sampling, guided by the following selection criteria:

1) In case where only one organization within a province carries out cultural missions, all samples from that organization will be included in the research. This will involve municipalities and provincial administrative organizations.

2) In cases where multiple organizations within a province have cultural missions, sub-district municipalities and sub-district administrative organizations will be considered. Selection will be based on exceptional cultural capital, such as important cultural sites or local traditions. Three sub-district administrative organizations and three sub-district municipalities meeting these criteria will be chosen for inclusion in the study.

### **Key informants**

In this study, key informants consisted of 15 cultural executives and practitioners representing eight local government organizations. The selection of key informants was carried out using purposive sampling. The criteria for selection included being an executive staff member, a specialist involved in mission-based cultural work, or a representative from the cultural department of the respective local government organization. The researchers specifically chose key informants from local administrative organizations situated in areas with significant cultural heritage or notable regional traditions. This selection aimed to highlight examples that excelled in both tangible and intangible cultural aspects, making them potential focal points of research.

### **Data collection**

Interview guidelines were used as a tool for data collection. These guidelines were developed by studying relevant documents and literature to ensure their effectiveness. The interview guidelines comprised a set of questions designed to elicit important information regarding the conditions of use, management practices, challenges, and the demand for cultural capital information.

Data collection was conducted through in-depth interviews, utilizing the interview guidelines as the primary tool. To initiate the data collection process, interview appointments were scheduled with the participants, and the interviews were conducted in person on the designated date and time. The data collection phase spanned a duration of four months, specifically from February to May 2023.

### **Data analysis**

The qualitative data analysis in this study focused on content analysis and the interpretation of findings. Descriptive analysis was employed to analyze the content, utilizing the qualitative data analysis software, ATLAS.ti (Demo), as a tool. The analysis process involved several essential steps, including data collection, coding, reflection, memoing, data synthesis, and result discussion, aligned with the research topics.

1) Data collection was conducted with a specific focus on the main topics or issues related to the utilization and management of cultural capital information.

2) Coding: The data was systematically coded, starting from phrases, sentences, or paragraphs, to facilitate information retrieval and compilation. Conceptual variable coding, term classification, correlation analysis, and keyword identification were performed. This involved identifying key messages through quotations, specifying codes to categorize the quotations, constantly comparing each quotation to assess consistency and harmony within the specified code, and establishing relationships between objects to create a conceptual diagram.

3) Reviewing and reflecting on the coded data set was carried out to examine whether it corresponded to the conceptual variables. In cases of inconsistency, the conclusions were reassessed and reconsidered.

4) Memoing: Temporary conclusions were drawn, involving the writing of theoretical ideas derived from the coding process. This included capturing the relationships between information codes that the researcher found particularly interesting.

By following these steps, the study aimed to systematically analyze the qualitative data, extract meaningful insights, and develop theoretical conclusions based on the patterns and relationships identified during the coding and analysis process.

## RESULTS

Data for this study was collected through interviews with CEOs, cultural practitioners, and representatives working in local government agencies. A total of 15 participants from eight organizations took part in the study, including 7 males and 8 females. The participants' age range was between 40 and 60 years old, and most of them possessed more than ten years of professional experience in culture-related fields.

The job positions of the participants included one deputy municipal, five directors of the education division, two individuals from the head of the education and culture division, four professional education academics, one educational academic, one professional tourism developer, one assistant administrative officer, and one local administrator.

The focus of this research was to examine the current situation of utilizing and managing cultural capital information. The research findings can be divided into two main areas: 1) the current state of cultural capital information utilization, and 2) the current state of cultural capital information management.

### 1. The current situation of cultural capital information utilization

#### *Types of cultural capital information*

Cultural capital information in Roi Et Province can be divided into three categories: intangible, tangible, and administrative information.

##### 1. Intangible cultural capital information:

- Traditions, ceremonies, and festivals: where traditions, ceremonies, and festivals in the province are linked to religious concepts and beliefs such as Heet Sib Song, Kong Sib Si, or the 12 month Tradition. The important local festivals of the province are Boon Phawet, Boon Bang Fai, Boon Khun Lan or Boon Kum Khao, etc.

- A way of life is knowledge and practice about nature and the universe, such as knowledge of rice planting; weaving, such as weaving in the Saket pattern, the golden turtle pattern, and local patterns; and herbal treatments, such as the use of *Smilax perfoliata* Lour as a tonic.

- Performing arts, used in local traditions and annual festivals such as sacrificial dances, rocket launches, Mo Lam performance, and folk music.

- Folk literature and legends such as Thung Kula Rong Hai folk legends, the Legend of Uphaad Chan, etc

2. Tangible cultural capital information:

- Archaeological sites such as Ku (castle), Sim (church), monuments, etc.
- Manuscripts such as palm leaves, etc.
- Wall paintings such as Hoop Taem, etc.
- Other objects such as ancient Phawet fabric, lintels, ancient Buddhas, etc.

3. Administrative cultural capitals information:

It is a type of cultural capital information related to policies such as ordinances, announcements, activities, projects, budget management, personnel development, coordination with various organizations, cultural cooperation networks, etc.

### ***Purpose of using information for cultural capital***

Information is primarily utilized for planning and policy development within administrative organizations. Local and provincial offices use ordinances and operational plans as guidelines to manage activities, projects, and budgets. Information also supports education and learning in local cultures through various means, such as:

1. Incorporating cultural content, such as teaching activities on local cooking wisdom and traditional sweets, into the curriculum or as part of courses taught by village elders.

2. Providing brief training sessions for students and community members to introduce local history and archaeological sites to tourists. This contributes to tourism and the promotion of local products. The ultimate objective is to preserve and pass down cultural heritage, wisdom, beliefs, and positive traditions within the local community.

### ***Access to cultural capital information***

The informants primarily collected data through person-to-person information sources, primarily by conducting interviews. They obtained information from various individuals, including village philosophers, community leaders, academics, and sought information from specialized agencies or institutions such as the Fine Arts Department. Additionally, some participants also accessed information from websites of different agencies, including the Ministry of Culture website and specialized agency databases.

### ***Sources of cultural capital information***

Most of them received information from

1. Personnel information sources include villagers with knowledge and expertise and academics.

2. Institutional information sources, especially from the Fine Arts Department at the Roi Et National Museum, which provides accurate and reliable information.

3. Internet resources used to search for basic information It is used when looking for information about plans, policies, and activities. and culturally relevant projects.

### ***Modernization of cultural capital information***

Many individuals tend to overlook modernism and rely on information provided by village elders. However, new information is incorporated on an annual basis and undergoes validation. There is a focus

on reviewing the specifics of cultural administration, including the activities that need to be completed each year in alignment with the established plan. Budget allocation rules are based on data from the previous five years.

### ***Format of cultural capital information***

Most people use printed information, such as books, academic journals, and information downloaded from official websites and government institutions.

### ***Problems of accessing cultural capital information***

There is a lack of academic experts in the field of cultural capital who could provide accurate and reliable information. The information obtained was often outdated, and the existing databases were not regularly updated. There is a notable absence of an up-to-date cultural capital classification system, leading to non-standardized information collection practices. Additionally, there is a lack of a designated individual or entity responsible for managing cultural capital information.

## **2. The current situation of cultural capital information management**

### ***Cultural capital information management policy***

It was found that there is a lack of a written policy specifically addressing the management of cultural capital information. Instead, the management practices are carried out based on assigned roles and responsibilities within the existing management structure. The obligations, ordinances, and overall management of cultural capital information primarily fall under administrative policies implemented by central government agencies, such as provincial culture departments.

### ***Organization of the cultural capital information system***

There are two forms of cultural capital information storage:

1. Cultural capital information is stored as a document file in the form of uncategorized office documents
2. Database or information storage system. Most of them do not have a database or information storage system. There is only one agency that stores information in the form of a database, namely the local wisdom database. divided into 11 fields: 1) Agriculture, 2) Industry and Handicrafts, 3) Traditional Thai Medicine, 4) Resource and Environmental Management, 5) Funds and Community Business, 6) Welfare, 7) Arts, 8) Organizational Management, 9) Language and Literature, 10) Religion and Tradition, and 11) Education.

### ***Information storage methods and formats for cultural capital information***

Information storage methods and forms of cultural capital information. Most of them are stored as data files, such as a register of folk wisdom and electronic files in a word processing program, and other programs, animation files, and image files, some of which are stored on social media for use in dissemination.

### ***The person responsible for cultural capital information***

Person responsible for cultural capital information. Most of them are personnel in departments related to education and culture. tourism developer, the person responsible for administrative work, etc.

### ***Cultural capital information service***

It was found that most services were provided to government agencies, the private sector, educational institutions, the public, academics, students, and tourists. In the form of publications such as brochures, manuals, lectures, interviews, site tours, websites, and social media, and training, such as training for little guides. Which often encounter problems in providing services, such as new and up-to-date information, no website services, a lack of modern information technology, no budget for dissemination of documents, no computer technicians, and no storage of standardized data.

### ***Cooperation in the management of cultural capital information***

Cooperation is established with national-level agencies, including the Fine Arts Department and the Ministry of Culture. At the provincial level, cooperation is fostered with the Provincial Cultural Bureau, the Provincial Tourism and Sports Bureau, the Provincial Administrative Organization, the Community Development Office, and the Provincial Agricultural Office. Additionally, there is an extensive network at the district level, encompassing local cultural councils, community leaders, schools, and educational establishments within the local community.

### ***Cultural capital information management problems***

Problems of cultural capital information management are:

1. There are no personnel with expertise in culture and cultural capital information management.
2. There is no budget for cultural capital information management. including data collection, organization, and service.
3. There is no standard information system for cultural capital and information technology. For local government agencies.

### ***Information Management Requirements***

The requirement for information management are as follows:

1. There is a need for the system to be able to store basic data. Especially information about traditions in the community to be able to store details in depth including wisdom information and tourist information.
2. Being able to connect the information needed for planning in many sectors, such as budget allocation or continued development in different forms, with the cultural information that is stored.
3. Desire to use modern technology published through the website or social media for easy access to information that can be searched through a search engine.
4. The information must be up to date. Constantly updated, complete, and available in a variety of formats, including videos, documents, and PowerPoint.
5. The gathering of data ought to involve the community.
6. Requires expert, responsible officers who take responsibility for cultural work seriously.

## **DISCUSSION**

This study aims to investigate the current situation of information use and management in the cultural capital of local administrative organizations. The findings demonstrated that cultural personnel handle information, including its acquisition, organization, storage, dissemination, and use, in local administrative entities. This is because, in cultural operations, it is necessary to have the information used in the operation, such as ordinances and operational plans,



serve as guidelines for managing activities, projects, and budgets and supporting education and learning in local cultures, such as local wisdom courses or cultural youth guide training, etc.

The findings of this study are in line with those of Choo's (2002 as cited in Detlor, 2010) study, which suggests six distinct information-related processes or activities that must be managed: Identification of information needs, acquisition of information to address those needs, organization, and storage of information, design, and development of information products, distribution of information, and information use.

The types of cultural capital information found in the research are divided into three categories:

1. Intangible cultural capital information includes traditions, rituals, and festivals; ways of life; performing arts; and folk literature.

2. Tangible cultural capital information consists of archaeological sites such as Ku (castle) and Sim (church), monuments, original documents such as palm leaves, wall paintings such as hoop tam (wall painting), and other objects such as ancient Phawet cloth, lintels, ancient Buddha images, etc.

3. Administrative cultural capitals information it is a type of cultural capital information related to policies such as ordinances, announcements, activities, projects, budget management, personnel development, coordination with various agencies, cooperation networks, etc.

This relates to Bourdieu's classification of cultural capital (Bourdieu, 1986), which categorizes it into three categories: 1) Embodied state 2) Objectified state and 3) Institutionalization states. It is also consistent with the UNESCO classification of cultural heritage (UNESCO, 2003), which divides cultural heritage into 1) intangible cultural heritage (ICH) and 2) tangible cultural heritage (TCH). And cultural heritage information types from the Museum Information Framework (Reibel, 2008, cited in Wispat Chaichuay, 2017; Sander & Perkins, 1999;). There are three types of cultural heritage information: 1) Collections information, 2) Technical information, and 3) Business information.

## **RECOMMENDATION**

### **Recommendations for future research:**

1. Further research should aim to encompass all dimensions of cultural capital, exploring various types and forms to provide a comprehensive understanding.

2. The structure of cultural capital information should be tailored to the specific needs and contexts of organizations utilizing such information, ensuring its relevance and usability.

### **Recommendations for agencies:**

1. Government agencies that utilize cultural capital information should establish clear and written policies related to the management of such information, ensuring consistency and accountability.

2. Agencies should invest in developing the capabilities of personnel involved in cultural capital information management. This includes fostering cultural knowledge, information management skills, and the utilization of relevant technologies to effectively manage cultural capital information in alignment with local contexts.

3. There should be a concerted effort to establish a network of cultural cooperation with relevant agencies. Collaboration and information-sharing among agencies can enhance the management and utilization of cultural capital information, promoting a holistic and coordinated approach.

## ACKNOWLEDGEMENT

This study is part of a research project on community information systems for managing cultural capital for sustainable development. The project has been reviewed and approved by the Khon Kaen University Ethics Committee for Human Research based on the Belmont Report and GCP in Social and Behavioral Research. (Date of approval: 18 October 2022; Reference No.: HE653236).

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# Analysis of Information Features for Identification of Typical Thai Jewelry

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## ABSTRACT

The primary objective of this study was to conduct an analysis of the content characteristics of typical Thai Jewelry. Thai Jewelry possesses both physical and contextual attributes that contribute to its uniqueness and cultural significance. The research focused on examining Thai identity ornaments derived from archeological findings dating back to the Sukhothai, Ayutthaya, and Rattanakosin periods in the late 18<sup>th</sup> century, specifically during the reigns of King Rama 1-5(1782-1910). These Thai identity ornaments exemplify the amalgamation of artistic styles, sources, and materials from various eras, meticulously crafted to align with the beliefs and preferences of the Thai populace. Through an information-feature-based approach, the study employed a robust framework to analyze and document these ornaments, revealing valuable insights and convictions.

**Keywords:** Typical Thai Jewelry, Metadata, Cultural heritage information

## INTRODUCTION

According to anthropological research, typical Thai jewelry from prehistoric periods served a purpose beyond showcasing craftsmanship. Archaeological data suggests that these jewelry pieces were not merely created for display but were intended to enhance the aesthetics of the wearer's body. Jewelry acted as a primary medium through which individuals expressed their aesthetic sensibilities and fostered connections with others, the community, and the surrounding environment. Originally, jewelry was categorized using two terms: "Fine Arts Department", which referred to head ornaments, and "Thanim Pimpaphon", where "Thanim" signifies body jewelry. Another term that may be used is "Russ", as in "Soi Rust Phimpaphorn" (Fine Arts Department, 2016). However, in contemporary usage these days, the term "jewelry" is commonly used to refer to these adornments.

Metadata is information that is structured to describe other information resources, enabling efficient search and management of those structures. Each information resource has its own set of metadata elements, such as the title, author name, creation year, and content characteristics, etc. Additionally, there are rules for selecting and displaying information value for each element, as well as encoding methods for machine readability. These sets of elements, rules, and methods of encoding are referred to as metadata schemas (Baca & Getty Research Institute, 2008; Haynes, 2004; Laura, 2009; Öberg & Borglund, 2006). To align with the specific characteristics of different information resources, appropriate metadata frameworks are developed. This article presents the analysis results of Thai identity ornaments to identify metadata elements that will contribute to the development of a comprehensive metadata framework.

## LITERATURE REVIEW

Metadata refers to the structured description or description about information material. It involves descriptive data or characteristics of information materials or systems, with the purpose of managing, retrieving and using them, as stated by Haynes (2004). Metadata is specifically used for information resources and requires description of information resources that align with the features of each resource. These components of the information (Baca & Getty Research Institute, 2008; Laura, 2009; Öberg & Borglund, 2006) consist of Content, which means stories, data, or things that are recorded; Resources are intrinsic, invisible to analysis, and Context means basic information that helps explain the meaning of the document. It indicates essential information for understanding the document's meaning. Context includes details on creation, preservation, transactions, and copyright protection.

## METHODOLOGY

This study was qualitative research using documents analysis approach, focusing on features of information (Baca & Getty Research Institute, 2008; Laura, 2009; Öberg & Borglund, 2006). The research methodology was conducted in three steps: data extraction, data selection and data analysis.

- *Data extraction:* The data are extracted from two sources by using keyword “Typical Thai Jewelry” to search in Scopus and ThaiJo database. As a result, there are 204 documents from Scopus, and 192 documents from ThaiJo.
- *Data filtering:* All documents from step 1 are selected by reading the title, abstract, keywords and conclusion to choose appropriate documents.  
The content of papers relating to jewelry and Typical Thai Jewelry. There are some criteria to validate papers, such as, content of papers focus on Thai typical jewelry in Sukhothai, Ayutthaya, and Rattanakosin periods in the late 18th century, specifically during the reigns of King Rama 1-5(1782-1910); the length of paper is not less than 5 pages; documents concerning the research papers, history documents to show the details of typical Thai Jewelry.
- *Data analysis:* In order to analyze the data, we read the full text of papers to select the appropriate papers. Finally, 128 papers were selected for analysis. However, because of the limitation of researcher's time, this paper just focused on analyzing five prominent papers of typical Thai jewelry.

Selected papers are analyzed by reading and categorizing the contents of papers in topics and subtopics. The researcher categorized documents of typical Thai jewelry into three topics. The analytical criteria for one type of cultural heritage information were categorized into three aspects. Firstly, content pertains to the components indicates or embody the knowledge content within Thai identity ornaments. It involves internal traits that require reading and analysis to determine characteristics, consisting of 1) Religion and 2) Belief. Secondly, structure refers to elements that indicate or represent the physical aspects of Thai identity jewelry. It is an external aspect that relies on observation or measurement to determine the characteristics out of the characteristics and composition. Thirdly, context refers to the elements that describe the environment, the context of the jewelry characterizes the social context caste status. The findings of this study are shown in the research result.

## RESULTS

The results of the analysis of information features of Thai identity ornaments, categorized according to the features of information (Baca & Getty Research Institute, 2008; Laura, 2009; Öberg & Borglund, 2006), were divided into three aspects: 1) Content, 2) Structure feature, and 3) Context. The specific results for each aspect are listed below.

### 4.1 Content

*4.1.1 Religious considerations:* Brahmanism, a major belief system among Sukhothai people, holds great respect. The presence of evidence in various art forms, especially those associated with religion, shows that the Ayutthaya period used a significant amount of gold than preceding periods did. There was an increase in the use of patterns and originality, resulting in aesthetically pleasing works. Prior to the Rattanakosin period, Buddhism played a prominent role in inspiring Thai designs. This influence is significant in the way artisans and artists incorporate motifs such as lotus flowers, garlands, incense smoke, and candle flames into patterns like Kanok, Flame, and Bai-tet floral motifs.

*4.1.2 Faith:* During the Sukhothai period, there was a cult belief that significantly influenced the royal court and resulted in the creation of numerous idols and idol sculptures. In the Ayutthaya era, a belief in luck and prosperity prevailed. Additionally, a balanced and symmetrical composition was employed for safety purposes. Similar views were held during the Rattanakosin period, which was influenced by the Ayutthaya period.

### 4.2 Structure

#### 4.2.1 The head consists of Siraporn Kunthon Kanjiakjorn

*4.2.1.1 Siraporn:* In the Sukhothai period, the siraporn took the form of a crown with a visor. Balanced and symmetrical compositions were utilized across all styles. In the Ayutthaya period, the crowned siraporn exhibited two styles: male and female siraporn. Both styles feature a completely symmetrical composition. In the Rattanakosin period, a spire-shaped crown known as Mahaphichai Mongkut was prominent, often adorned with golden Buddha images that are intricately engraved, carved, and openworked.

*4.2.1.2 Kunthon:* In the Sukhothai period, Kunthon can be classified into two types: men's and women's. Each has distinct characteristics and element arrangements. The men's Kunthon, known as "kundaluput," features an upturned conical lobe shape. On the other hand, the women's Kunthon, called "Kunthonlady," exhibits an asymmetrical composition with a kite-shaped rectangular structure that diagonally extends to both left and right directions. In the Ayutthaya period, the Kunthon takes on a leaf-like shape, and the kundal is divided into two types for men and women. It incorporates both symmetrical and asymmetrical compositions. In the Rattanakosin period, the compositions become symmetric in both styles. The first style features a three-petaled flower garland with overlapping layers, creating a charming decorative effect. The second style showcases a six-petal eggplant flower kunthala pattern.

*4.2.1.3 Kanjiakjorn:* Kanjiakjorn in the Sukhothai period featured asymmetrical arrangements with a kite-shaped rectangular structure that extended diagonally to both left and right. It resembles a leaf shape in the Ayutthaya period a style that uses a balanced symmetrical and asymmetrical composition, and in the Rattanakosin period it was a lapidary with a body structure in the form of Kranok leaves.

## **4.2.2 The body consists of Kongsaw, Sangwan, Thap Suang**

4.2.2.1 Kongsaw: Kongsaw of the Sukhothai period consists of 2 types: Kongsawus and feminine. Most styles use a symmetrical balanced composition, and has 2 different structure lines: the outline style and the mane style. The majority of Kongsaw ornaments were of a princess length, followed by a collar type (collar). In the Ayutthaya period, all forms of ornaments were arranged in a symmetrical balanced composition. In the Rattanakosin period, most of ornaments were decorated with patterns such as Prachayam, 8-petal round flower patterns, Kra-Ra-Oi patterns, fish roe patterns, squares, and triangles. The patterns were placed symmetrically.

4.2.2.2 Sangwan: Sangwan, worn across the shoulders, existed in three styles during Sukhothai, Ayutthaya, and Rattanakosin periods. The first style involved a single line crossing one shoulder, while the second style featured crossing line in the middle of the body and a cross at the navel. The third style, known as Sangwan necklace, draped diagonally across the shoulder and under the armpit, connected to the neck. The appearance of the body ornament was divided into 2 types: smooth surface and rosary string.

4.2.2.3 Thap Suang: The Sukhothai and Ayutthaya periods have similar elements, utilizing a symmetrical balanced composition. Most of the frames are rhombuses, resembling pieces of gold breastplates shaped like arrowheads. In the Rattanakosin period, Thap Suang ornaments were divided into types: compositions with symmetrically balanced forms and rectangular kite decorations.

## **4.2.3 The arm consists of Phahurat, Thongkon, Thamrong**

4.2.3.1 Phahurat: Sukhothai period Phahurat The Ayutthaya and Rattanakosin periods have a similar composition, which is a symmetrical balance arrangement, divided into 2 types of housing: round wire style. and sheet form

4.2.3.2 Thongkon: Sukhothai period goldfish uses a symmetrical balanced composition. The main structure of the goldfish body is divided into Thong-Pling style, knife-edge style, round line, and flat sheath style. The Ayutthaya period uses a symmetrical arrangement of elements, and in the Rattanakosin period, the Thong Korn body on the Thepanom sculpture was carved wood to form a shape. and patterns, and then painted in gold, adorning the body with round and oval-shaped stained glass Golden body on the Ayutthaya period.

4.2.3.3 Thammarong: Thammarong in the Sukhothai and Ayutthaya periods have similar elements, namely joining metal pieces with gold, padding, dungling, and carving patterns. and decorate the case with carvings and the Rattanakosin period uses a symmetrical balanced composition. and asymmetrical, consisting of 2 styles, Mondop shape and knife sheath.

## **4.2.4 The feet consist of Thong Phra Bat.**

4.2.4.1 Thong Phra Bat: Thong Phra Bat in the Sukhothai period has a knife sheath body shape, consisting of 3 lines of wire frame. The belly-leech-shaped wire in the middle flanked by 2 wires on both the upper and lower parts of the thong. It is a symmetrical balanced composition in the Ayutthaya period and in the Rattanakosin period. It is symmetrical and has a flat sheath shape. The edges are decorated with decorative patterns similar to frescoes decorating the outside of the main structure.

## **4.3 Context**

Context of Sukhothai can be divided into 2 categories: high-ranking individuals and commoners. High-ranking people are angels, kings, phrayas, dao, or nobles in the royal court. On the other hand, common people during the Sukhothai period included villagers, merchants, hunters.

The social context of the Ayutthaya period jewelry reflected specific characteristics related to social status, caste, conservative styles, and limitations imposed on certain groups. Similarly, in the Rattanakosin period, jewelry conveyed social context through indicators of class status, caste, conservative style, financial means, age, opportunities, time, and values.

## **DISCUSSION AND CONCLUSION**

The analysis of Typical Thai Jewelry, based on the attributes of information, reveals three characteristics that constitute an information resource (Baca & Getty Research Institute, 2008; Laura, 2009; Öberg & Borglund, 2006). These characteristics include the physical attributes, such as the composition of head ornaments (Siraporn, Kunthon, Kanjiakjorn), personal ornaments (Krongsa, Sangwan, Thap Suang), arm ornaments (Phahurat, Thongkon, Thammarong), and foot ornaments (Thong Phra Bat). Additionally, the context features cover elements that describe the contextual environment of the jewelry, including social context, class status, caste, conversational styles, and limitations imposed on specific groups. Furthermore, the content features involve values or concepts that contribute to traditional practices and shared cultural heritage.

The primary goal of the research is to evaluate information features of Thai identity jewelry in Thailand, specifically focusing on content, physical traits, and context. While the analysis currently focuses on jewelry from Thailand, a comparison with jewelry discovered abroad that incorporates language and characters related to different cultures could provide valuable data for expanding and developing the metadata schema to suit various national contexts. This exchange of information sharing on cultural heritage will contribute to fostering cross-cultural harmony.

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# Development of Notification System for Deadline Book via Line Application

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## ABSTRACT

This research aims to develop an automatic book return deadline notification system via Line application and to study the satisfaction and needs of users in receiving notifications, news, library services and library activities at Faculty of Science Library, Chiang Mai University. The population in the study were users who registered to participate in notification system for deadline book via Line application with 86 participants selected randomly.

The tools in this research were 1) notification system for deadline book via Line application developed using HTML, PHP, JavaScript, MySQL and Line notify API 2) A satisfaction questionnaire regarding the usage of the system and data analysis using frequency, percentage and mean.

The result of the study was found that users were highly satisfied with the system 50.00%. registration processes, service timelines ( $\bar{x} = 4.37$ ), friendly workers and manners in very good level ( $\bar{x} = 4.43$ ), When considering the notification system, users were satisfied with clear and consistent notifications that matched their needs ( $\bar{x} = 4.38$ ). Users' needs to be notified about news and library services ( $\bar{x} = 4.36$ ), followed by receiving notifications about overdue books ( $\bar{x} = 4.20$ ).

The results of the system development informed users about the book return deadlines, preserved their borrowing privileges, and helped reduce the fines for late returns. It also provided guidelines for the library to develop innovative services to create user satisfaction and impression to the library service development more effective.

**Keywords:** Library service, Notification system, Line notify

## INTRODUCTION

Currently, the behavior of library users has changed. The accessibility of information via portable devices has increased convenience, necessitating libraries in the digital age to innovate for easier and faster information access. Libraries have thus incorporated technology to manage operations to facilitate users and streamline processes.

The Faculty of Science Library, Chiang Mai University, recognizes the importance of academic services that benefit the community, responding to the faculty's mission goals for 2020. The library personnel of the Faculty of Science have to developed innovative library services to reach more users.

The researcher collected problem points and user requirements to guide the development of an automated book return reminder system. The system uses modern information technology to support library services and improve the efficiency of library services. Library news is disseminated widely to



users. From the study and collection of user data before the development of the system to solve the problems encountered to support library services. It was found that users would like the library to notify the due date for returning books as some users forget the return date and incur fines.

Developing an automatic book return reminder system via the Line application is innovation intended to remind users about the due dates of books, as well as disseminating news, public relations, and various library activities especially to the users who borrow books from the Faculty of Science Library.

## **OBJECTIVES**

1. To develop an automatic book return reminder system via the Line application.
2. To study the satisfaction and needs of the users in terms of receiving reminder messages, news, public relations and various activities of the Faculty of Science Library.

## **LITERATURE REVIEW**

The alert system refers to a short message service system that sends various event notifications to mobile phones. It can be integrated with other software systems an organization may have in various forms. Users can identify, address, and respond to any problems that may impact essential applications and business operations. With advance warning, the system can send messages to relevant individuals and can be applied to other systems as well.

### **Types of notification include:**

1. Server SMS Alert: In case the server is down or stops working, the system sends an SMS notification to the server administrator's mobile phone.
2. E-commerce SMS Alert: Notifies when someone orders products via the website, useful for online businesses.
3. Job SMS Alert: Notifies when there are new job positions, useful for recruitment businesses.
4. Bank SMS Alert: Notifies when there is a bank account transaction, such as a deposit or withdrawal, useful for banking businesses.
5. Engine SMS Alert: Alerts in case of machinery failure or when machinery operation exceeds standard parameters.

### **Line application**

Line is a widely-used communication application compatible with smartphones, tablets, and computers. This application is especially popular in Thailand and globally, serving as an accessible, convenient, and rapid medium of online communication. Line enables users to engage in conversations and interactions at any time. Users have the liberty to communicate or block text messages, voice messages, and can post images, stickers, videos, and various links to their timelines. It also supports multiple file types for sharing such as .jpeg, .pdf, .ppt, .doc. (Siam University Library, 2022)

### **API**

Application Programming Interface is a communication channel facilitating data exchange from one system to another via the libraries (functions/modules/utilities) provided by the API creator or service provider. It allows developers from other systems to connect with the service provider's APIs, thus enabling more straightforward and quicker system development without the need to understand or alter the API's code. APIs are sets of commands that developers use when they need to access data on a

website that has APIs available. This data access can involve extracting data or sending data to the website. In essence, APIs are akin to a language that computers use to communicate and exchange data freely, be it between a server and a client, between servers, from one website to another, or between a user and a server. (Demeter ICT, 2023)

### **Related work**

Hantrakul (2005) studied the development of an SMS alert system for new emails for staff and students of Chiang Mai University. The system helps prevent missing important communication via email and also promotes the usage of Chiang Mai University's email system. The alert system has been developed to allow users to enable or disable the alert service, specify the email address and mobile phone number to which the system sends alerts, and check the alert statistics. The system is installed on a server and users can also use various functions through a browser on a client machine connected to the internet.

### **LIMITATIONS OF THE STUDY**

Chiang Mai University Library offers a service to alert members via SMS before the due date. This is to enable members to renewable book by themselves, return the books on time and preventing any fines due to forgotten returns. Users can subscribe to receive SMS alerts at the library's counter or online via <https://library.cmu.ac.th/services/sms2>.

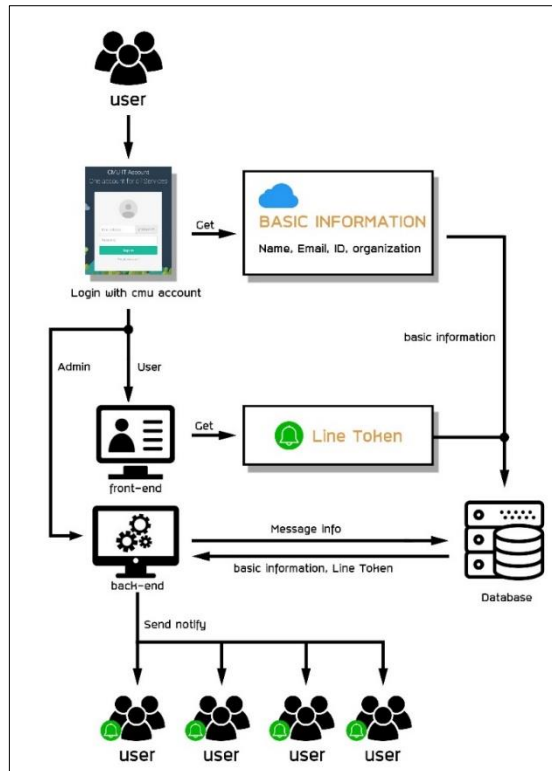
However, there are limitations for some users who experience nuisance text messages (SMS Spam) unwanted and unsolicited messages. These are disseminated to mobile phone numbers frequently and can be disruptive to the users to the point they may miss reading the library's SMS reminder about the due date for book returns. Some users may block SMS Spam on their mobile networks, which prevents the library from sending messages to library members, resulting in unawareness of the return dates and subsequently incurring fines.

### **SYSTEM DESIGN**

The development and design of a book return reminder system via Line application involves studying information from the old service model (SMS) in operation, coupled with new system requirements from operators. Designing a new system, based on the principles of information system design, using tools such as a context diagram and a data flow diagram to give an overview of the system and the relationship of related systems.

#### **Database system design**

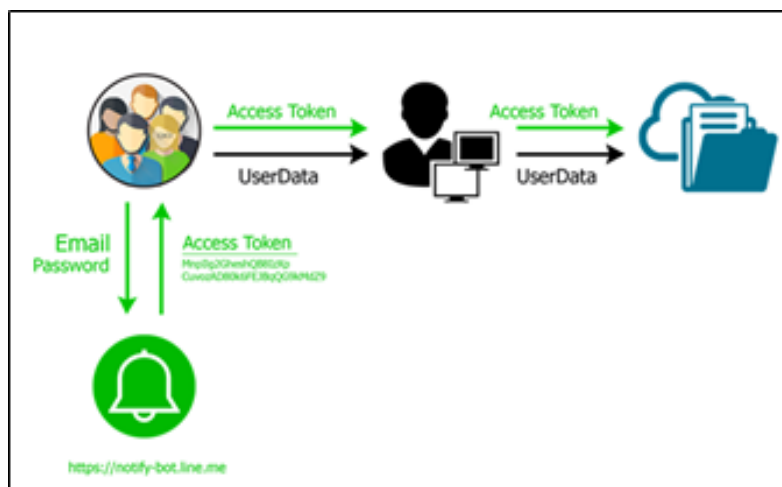
System developers design a database system to various processes within the system. They use a data flow diagram to demonstrate the flow of data from external sources into the system, showing how data flows from one process to another.



**Fig. 1. System processing**

This figure explained the relationship between responsible in various roles with the operation system, service users, and workers as follows:

1. User registers to request services through the system using their CMU IT Account for first-time registration, and registers for a Token ID at notify-bot.line.me to receive notifications in their private Line application (Line Notify)
2. Databases collected member data including names, surnames, university's email address, library membership numbers and affiliated/faculties etc.
3. Administrator registers the Token ID of individual users to connect with the Line application's API (Line Notify) in the database.
4. Workers compile a daily list of members who are due to return books to send a reminder message to service users about individual due dates.



**Fig. 2. Line notification processing**

The administrator will log the notification message by individual user's Token ID from the database to specify the destination of the Line application user, and the system can send messages to all service users simultaneously or send to user groups.

## **SYSTEM DEVELOPMENT**

The researcher has analyzed and designed the system based on the operation part and the service user part to ensure comprehensive system operation. System development has utilized tools that support service formats with system development tools as follows:

1. Database creation and management: System developers have utilized MySQL database management software for designing and creating databases, managing all databases, creating databases as specified, and according to the system's steps and relations.
2. Programming to control the system's operation: Developers have used HTML, CSS, PHP, JavaScript for programming to connect to the database and process all data in the system. They've designed the system operation of book return due date notifications in two parts:

User part:

- Message sending history
- Personal information
- Arranging message type
- User guide
- Turn off message notification mode

Admin part:

- Dashboard
- Message history
- Menu : Manage User, Due Date Report, Member Report
- User guide

3. Sending messages: System developers have used Line notify API of the Line application to send notification messages to users.

## **USER INTERFACE**

The development of alert system via Line application, the system developers have designed a user interface with the following details:

Users can log in by their CMU IT Account on website: <http://library.science.cmu.ac.th/alert>. After logging in with their CMU IT Account, the system will automatically redirect users to the Line application registration screen. Users will have to choose to receive alerts through the Line application by selecting "Receiving individual notifications from Line Notify" and proceed to connect their Line application directly to the system.

The user's interface will display various menus such as:

- All messages history: arranged by latest messages
- Personal information: showing first names, affiliation and type of membership
- Message type sorting: show all, due date alerts, library news
- User manual: displayed as a PDF to learn and use the system correctly
- Disable message alert mode: If users want to cancel the service, they can log in to disable notifications

## **IMPLEMENTATION**

The operators providing automatic book return deadline alerts via the Line application. The alerts were specifically for books borrowed from the Faculty of Science Library. The system was developed in collaboration with the automated library system (Innovative Millennium) using the “create list module”. When users successfully registered on the website using their CMU IT Account were displayed for the operators to verify and grant access. Additionally, a note was added with the text “x = SLAS2020” in the Innovative Millennium automated library system.

The operators were responsible for creating a list of members with book return deadlines for the next day. The list included the names of users with their respective return dates, with notifications sent via Line Notify every day at 2 PM.

## **RESEARCH FINDING**

This research developed a system and surveyed user satisfaction. Classified by gender, status, academic year and faculty/major study.

### **Population**

The service users who borrowed books from the Faculty of Science Library, Chiang Mai University, and registered for the automatic book return reminder via Line application total 188 peoples. The sample group for this research was randomly selected from the entire population, totaling 86 peoples, accounting for 45.74%.

### **Data collection and statistics**

The satisfaction survey data for the automatic book return reminder service via Line application was collected from 188 users in the form of an online survey on the website <https://cmu.to/SLAS>. Due to the coronavirus (COVID-19) situation, all university learning has an online format, reducing the number of library users. As a result, the library received online responses from 86 users. The results of the data analysis are presented in three sections as follows:

Section 1: Analysis of general information and status of the respondents

Section 2: Analysis of satisfaction with the use of the system

Section 3: Other suggestions

### **Regarding service provision**

Users who answered the questionnaire expressed high satisfaction with the structured registration process and appropriate service times ( $\bar{x}$  =4.37), correct and quick service ( $\bar{x}$  =4.34), and rapid and comprehensive information and news dissemination ( $\bar{x}$  =4.23).

### **Regarding service providers/staff**

Users who answered the questionnaire expressed high satisfaction with the staff's politeness and friendliness ( $\bar{x}$  =4.43), the quality of guidance or answers to questions ( $\bar{x}$  =4.35), their care, eagerness, and willingness to serve ( $\bar{x}$  =4.34), and clear explanation and guidance on service processes ( $\bar{x}$  =4.31).

### **Regarding the notification system**

Users who answered the questionnaire expressed high satisfaction with the clarity of the notification system ( $\bar{x}$  =4.38), the service's compatibility with their needs ( $\bar{x}$  =4.38), the ease, convenience, and

consistency of the notification system ( $\bar{x} = 4.37$ ), and the speed, accuracy and correctness of notifications ( $\bar{x} = 4.31$ ).

Overall satisfaction with the automated book return reminder system via the Line application among the 86 respondents was as follows: 43 respondents (50%) were extremely satisfied, 34 respondents (39.53%) were highly satisfied, 5 respondents (5.81%) were moderately satisfied, 3 respondents (3.49%) were minimally satisfied, and 1 respondent (1.16%) was slightly satisfied.

## CONCLUSION

The purpose of this research is to develop a notification system of book return reminder via Line application, and to study user satisfaction and demand in receiving reminder messages, news, public relations, and various activities of the Faculty of Science Library, Chiang Mai University. The population studied was the users who borrowed books from library and registered via the Line application. The sample used in the research was obtained by random sampling total 86 peoples (45.74%).

The majority of respondents were male, with 52 people (60.47%) and females accounted for 34 people (39.53%). Most respondents were undergraduate students with 56 people (65.12%), followed by graduate students with 16 people (18.60%) and staff with 8 people (9.30%).

The researcher conducted a survey on the satisfaction towards the use of the automatic book return reminder system via Line application in terms of service procedure. It was found that the majority of respondents were satisfied with the registration process and the appropriateness of the service time, rated highly ( $\bar{x} = 4.37$ ).

In terms of service providers/staff, it was found that the majority of respondents were satisfied with the polite and friendly service, rated highly ( $\bar{x} = 4.43$ ). Following this, the service providers were able to provide good advice or answer questions, also rated highly ( $\bar{x} = 4.35$ ).

In terms of the notification system, it was found that the majority of respondents were satisfied with the reminder system that provided clear instructions and met their needs, rated highly ( $\bar{x} = 4.38$ ).

In the overall satisfaction of the notification system, it was found that 50 percent of respondents (43 people) were extremely satisfied with the developed system.

## DISCUSSION

The results of the research on the development of notification system for deadline book via line application reveals several significant points for discussion as follows:

The development of an automatic book return reminder system is beneficial to users. This system serves as a stimulus and reminder for users to return the books on time and if they wish to renew the books they renewable on the library's website. Furthermore, this system aids in reducing the number of overdue books in the library and prevents incurring overdue fines.

Regarding the service process, as the library has clearly publicized the method of registering to link users' Line accounts with the automatic book return reminder system, users are highly satisfied with the systematic registration process. In addition, there are an online user manual, allowing users to conveniently and quickly follow the steps. As for the service providers/librarians from the faculty of science, users are satisfied with their services as they are polite, friendly, and are able to provide effective advice and answers to inquiries.

As for the automatic book return reminder system via Line application, because the system has a clear operating explanation and its development arose from the problems and suggestions of the users, it aligns well with the users' needs. As a result, 50 percent of users are highly satisfied with the overall system. The research also found that users want the library to notify them of the due date for returning

books along with a list of overdue books. The library will consider these suggestions to provide more efficient services in the future.

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# Opening of University Libraries to Local Community: Enhancing Access and Revitalization Strategies for University Libraries Focusing on Local Youth

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## ABSTRACT

This study focuses on opening University libraries to the local community and developing revitalization policies for youth engagement. It aims to enhance access, promote community outreach, and address the challenges of declining physical library usage and the growing reliance on digital resources. This research aims to evaluate the opening of national university libraries to the South Korean community and proposes strategies to promote the usage of local youth, fostering a strong community connection. Additionally, the study examines the impact of demographic factors, technological advancements, and library services on the library engagement of local youth. Statistical analysis, surveys, and case studies from diverse university libraries are employed to provide comprehensive insights into the subject. The results indicate a positive correlation between opening policies and satisfaction levels among young users. Practical recommendations are proposed to enhance community-focused services, including collaborative partnerships with public libraries, implementing community outreach programs, and offering volunteer opportunities tailored to young people. Opening university libraries to the local community creates an environment that encourages the active participation of the youth in university activities, revitalizing library usage and contributing to the overall development of the institution.

**Keywords:** University Library, Opening to Local Community, University students

## INTRODUCTION

In the modern era of digitalization, the significance of knowledge and information as driving forces in society has become increasingly apparent. University Libraries, with their extensive collections of print and electronic resources, are widely acknowledged as essential institutions for higher education and research. Traditionally, university libraries have primarily served their students, professors, and researchers by providing academic resources and support. However, in recent years, the role of university libraries as gateways to knowledge and information has expanded beyond their traditional functions.

University libraries have the potential to impact the educational and personal development of young people across their local communities beyond their students and faculty members. However, access to library resources is often limited or restricted to university affiliates, and even when open to others, there may be differentiation or limitations imposed on external users.



Many university and academic libraries, regardless of their types, have tried to reach out to more users outside the campus. This kind of outreach aims to reach out to their users, encourage the use of the library and its resources, and promote a positive image on campus and often in the community (Carter & Seaman, 2011). Several articles have focused on this issue, referring to it as community outreach and community engagement (Carter & Seaman, 2011; Cho, 2011; Hang Tat Leong, 2013; Harris & Weller, 2012; Schneider, 2013; Shapiro, 2016). Hang Tat Leong (2013) states that it “is the best approach to respond to the increasing significance of community engagement in an academic environment” and suggests four categories of (1) community access, (2) information literacy, (3) cooperation, exchange, and partnership, and (4) exhibitions and scholarly events. Interestingly, as Miller (2018) accurately pointed out, “most libraries conduct some method of outreach without fully recognizing it has already been implemented.”

Opening of university libraries to the local community represents a narrower sense of this outreach that has been widely introduced in South Korea, somewhat differently from any category from Hang Tat Leong (2013). The purpose of this study is to investigate the current state of university libraries’ engagement with the local community, identify potential barriers or shortcomings in their policies, and propose ways to improve accessibility for community users (Kim & Kim, 2011) as a unique case of community outreach of university libraries.

Opening of university libraries to the local community, similar to community outreach, aims to strengthen their role in the community and benefit a diverse range of individuals. This article emphasizes the importance of providing young people with access to a wealth of specialized information resources and excellent university facilities (Chang, 2009). Open policies that prioritize youth enable university libraries to also serve as a social safety net during their transition to employment after graduation. Additionally, young community members can utilize the professionalism and credibility of university library resources for job preparation. By expanding their services to residents, universities fulfill social responsibilities and receive positive feedback, aligning with their survival strategy (Yoon, 2003) and their role as information centers.

As a part of the university, the university library should strive to encourage and promote the use of its resources by various customers, both internally and externally. This support is crucial for sustainable development and even the survival of the universities, especially in competitive environments. Opening university libraries to the local community is one strategy that can be considered to achieve this goal. This study aims to provide a general overview of such programs in South Korea.

## **RESEARCH METHOD**

This study investigated the university library services to provide local communities by accessing the website of each University library. The examination focused on categories such as “Library Information,” “Library Usage,” “User-base information,” and “Ask a Librarian.” In some cases, additional information was gathered through telephone interviews. This included details such as the actual usage rates by outside residents, the availability of academic databases both within and outside the library, and the availability of interlibrary loan and document copying services. However, due to time constraints and a large number of subject universities, in-depth investigations, such as interviews with librarians responsible for community outreach and membership, were not conducted.

This study aimed to encompass a wide range of university libraries to avoid potential biases arising from different environments and the unique characteristics of the local community associated with certain university libraries. Approximately 40 national and public universities across South Korea were surveyed. Branch libraries were excluded to prevent duplication.

## **ANALYSIS OF THE OPENING OF UNIVERSITY LIBRARIES TO LOCAL COMMUNITY IN SOUTH KOREA**

Table 1 presents an overview of the survey conducted on the opening strategies of 15 selected national university libraries to the local community in South Korea. The table is arranged alphabetically and provides information on the different methods and targets of opening employed by each university. The examination conducted by the universities covers membership categories, the extent and level of services provided, availability and duration of lending resources, access to study rooms, and the availability of digital resources.

Most university libraries have opening policies that are based on various membership categories and involve charging members a certain amount of fees. Table 1 provides suggested category names. In South Korea, many national university libraries allow regional community access by implementing some form of registration. The categories typically include residents, students on leave, graduates, program completers, cooperating institutions, and others approved by the institution's head. Notably, graduates and program completers are treated as external users, distinct from currently enrolled students. For graduates to utilize their university library, they need to register as members and pay the same membership fee as residents, adhering to the resident's usage policy.

University libraries' opening policies can be categorized into three main levels: (1) lending service only, (2) lending service and online access, and (3) lending service, online access, and reading room use. The availability of these levels varies among libraries, with some offering all three while others have limitations. Moreover, there is a distinction between currently enrolled students and others regarding the number of items and duration for lending service and reading room usage. Extensions for lending services are often allowed for residents and graduates, with some libraries not permitting extensions at all. Additionally, residents and graduates may have restricted access to certain areas for material retrieval and limited usage of reading rooms during university students' examination periods.

Most university libraries have age restrictions for outside users, typically requiring them to be adults aged 19 or older residing in nearby areas. Further investigation through telephone calls to libraries without explicit age regulations on their websites revealed that there are generally no significant age restrictions for library usage if individuals have paid an annual membership fee or contributed to development funding.

Most libraries impose a usage fee (Jeong & Sakong, 2010) on community users, which can take the form of a non-refundable "membership fee," "development fund," or refundable "deposit" and "security deposit" upon the termination of library membership. However, the specific amounts vary among libraries.

As depicted in Table 1, the survey reveals that the overall opening policies of university libraries differ based on their unique circumstances, environments, and characteristics, which are influenced by their parent universities' policies. This variation is evident in the different names used for services, including membership systems, external user services, and resident services, which may lead to confusion among residents. Additionally, the usage fees vary across university libraries and are referred to by different names, such as membership fees, development funds, and deposits.

**Table 1. Opening to the Community in Major National University Libraries in South Korea**

University Library Name	Category	Range and Level of Opening			Usage Fee	Age
		Lending Service (books/duration)	Facilities (reading rooms)	Viewing Electronic Resources		
Andong National University Library	Membership types (General, Graduates), Others	General members: 5 books for 14 days, Graduate members: Viewing only	○	○	General members: 50,000 KRW Graduates (Program completers), Students on leave: Free	
Changwon National University Library	Membership types (Residents, Others)	5 books for 14 days	○	○	Development Fund 30,000 KRW	
Chonnam National University Library	Daily pass (Local residents), Library card holders (Graduates of their own university, etc.)	5 books for 15 days	○	○	Library card holders: Deposit 50,000 KRW	
Chungbuk National University Library	Membership types (Graduates, General, etc.)	5 books for 14 days	○	○	Development Fund	19 years old and above
Chungnam National University Library	Membership types (General members, Special access members)	3 books for 10 days	○	×	Deposit 100,000 KRW	19 years old and above
Gangneung-Wonju National University Library	Local residents, Graduates, Others	5 books for 12 days	○	○	Annual fee 50,000 KRW	
Gyeongsang National University Library	Graduates, Local members, Partner institutions	3 books for 10 days	○	○	Local members: Development Fund 50,000 KRW	18 years old and above
Hankyong National University Library	Membership types (Lifetime, General, Graduates, Program completers)	General members: 5 books for 10 days Graduate members: 4 books for 10 days	○	○	General members: 30,000 KRW, Graduates/Program completers: 10,000 KRW (free within 2 years from the graduation/ completion date)	19 years old and above
Kangwon National University Library	Local residents, Graduates, Others	Residents: 5 books for 10 days, Graduates: 10 books for 15 days	○	×	Residents: 40,000 KRW	
Kyungpook National University Library	Membership types (General, Special, Preferred)	General members: 5 books for 14 days, Special members: 10 books for 14 days, Preferred members: 10 books for 30 days	○	General, Special members ×	General member annual fee: 100,000 KRW Special member annual fee: 200,000 KRW	19 years old and above
Pukyong National University Library	Membership types (Local residents), Graduates, etc.	General members: 3 books for 10 days, 5 books for 10 days (varies depending on the payment amount)	○	○	General members: 30,000 KRW, 50,000 KRW, 100,000 KRW	19 years old and above
Pusan National University Library	Membership types (Graduates, Donors, Retired staff, General public etc.)	Graduates, Program completers, and General public: 5 books for 10 days	○	×	Graduates and Program completers: Annual fee of 50,000 KRW General public: Annual fee of 100,000 KRW	
Seoul National University of Science and Technology Library	Membership types (Alumni, General, Special, Preferred, Honorary), Others	Alumni, General, and Special members: 5 books for 14 days	○	○	General members: Annual fee of 100,000 KRW	19 years old and above
Seoul National University Library	Membership types (Alumni, General, District Residents, etc.)	Alumni members: 10 books for 14 days, General/District	○	○	Alumni members: Annual fee of 100,000 KRW, General members: Annual fee of 120,000	19 years old and above

		Resident members: 5 books for 14 days			KRW Gwanak District Resident members: Annual fee of 80,000 KRW	
Seoul National University of Education Library	Annual members (Graduates etc.), Free members (Trainees, Students on leave, etc.), General public	General public: Only viewing and copying allowed, Annual/Free members: 3 books for 14 days	○	Annual/Free members ○	Annual/Free members: Annual fee of 30,000 KRW	19 years old and above

## SUGGESTIONS AND CONCLUSION

Based on the above analysis, we can suggest the following ideas for the improvement of the opening of university libraries to the community.

First, the opening of university libraries varies among universities, encompassing official service names, user categorization, fee structures, and the range of services offered, including lending services, access to electronic journals and academic databases, and facility usage. This variability may lead to confusion among external users when utilizing university libraries. In certain cases, there are disparities in services based on the user's residential area, resulting in unequal access and potential discrimination in information provision. Therefore, the development of standardized national guidelines or criteria is desirable. If university libraries adopt standardized community openness services nationwide, it will enhance accessibility and convenience for users.

Second, university libraries often offer limited and restricted services to their graduates, distinguishing them from the current students to respect the usage rights of the latter. However, once graduates have completed their studies, they are treated as external users and are required to pay fees for services. Therefore, it is important to establish guidelines specifically addressing the needs of university alumni, distinct from other community users.

Third, a significant number of libraries lack dedicated departments or personnel specifically assigned to handle community outreach initiatives. While certain university libraries have staff responsible for membership registration and guidance, many others rely on existing staff to fulfill these duties alongside their responsibilities. Therefore, larger libraries should establish dedicated departments for library membership services and community outreach efforts and appoint professionals to deliver high-quality services, including marketing the available services. Given the essential requirement of community openness in university libraries today, it is crucial to provide proactive services.

Fourth, in the current scenario, users who wish to access multiple university libraries within a local community are required to pay duplicate fees to each respective institution (Chang, 2009). In such cases, there should be a mechanism in place that allows users to register for membership at one library and gain access to all libraries within the region.

Fifth, there is a lack of systematic user introduction programs for community services aimed at educating residents, particularly young people, about the resources and services offered by the library. To address this gap, it is desirable to develop such programs through collaboration among libraries that provide community opening services. These programs can encompass workshops, guest lectures, and cultural events tailored to the interest of the youth, fostering a stronger connection between the library and the local community.

Sixth, residents are key customers of the local public libraries. In light of this, university libraries can establish partnerships with these public libraries, facilitating the sharing of resources and expertise. Such collaboration would enable the provision of a more comprehensive range of services to the local community. This partnership can involve joint programming initiatives and resource-sharing agreements, benefiting both university libraries and public libraries in the area (Kim & Kim, 2011).

Seventh, opening university libraries to community users creates volunteer opportunities for young people, enabling them to contribute their expertise and knowledge. These opportunities can involve tasks such as greeting visitors, assisting with research, and supporting outreach initiatives. Such initiatives not only foster stronger connections between the library and the youth in the community but also provide them with valuable experience and knowledge necessary for job preparation.

Lastly, University libraries that are open to the community should actively solicit feedback from local community members who utilize their services and resources. This feedback can be gathered through various channels, including online feedback forms, suggestion boxes, and community meetings. By maintaining regular communication with the community, the library can ensure that it remains responsive to their needs and interests.

By implementing these strategies, university libraries can effectively open their doors to local communities, fostering inclusivity for knowledge sharing and cultural exchange. As suggested by Miller (2018), the opening of university libraries to the community through outreach efforts can help the library maintain relevance and active engagement on both the campus and community levels. This, in turn, strengthens the overall role and impact of university libraries within the broader community. Additionally, by enhancing the satisfaction of young people in the local community, university libraries not only promote their utilization but also contribute to the overall development of the university.

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# Transforming the Communication Pattern in Social Media Use of the Elderly in Virtual Space

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## ABSTRACT

This article presents data about social media use among elderly dwellers in six districts of Bangkok. Mixed-method is used by collecting data from the elderly whose age over 60 years living Bangkok metropolitan area. The purpose is to present issues on the online communication transformation of older adults by comparing the pattern of communication between the real world and virtual space. The results of this study examined the social media skills of the elderly by evaluating four skills: media consumption skills, analytical skills, media producer skills, and participation skills. The results of a quantitative study found that the respondents had high overall media consumption skills. The total mean was 2.50 which is no bias in receiving information from social media. In terms of analytical skills, the overall is very high the mean was 2.64 found that they were avoiding useless information. While media producer skill had the total mean at 2.25 found that the elderly was not forwarding a wrong information or information that defames a person's reputation. Moreover, participation skills got a total mean of 2.18 that is the sample was expressing and responding with polite language in online spaces. All results from above related to the qualitative study that many seniors want to use social media as a tool and a channel to earn extra income for themselves leading to self-esteem in the elderly. It also strengthens relationships in the family. In addition, using social media enhance income and learn self-improvement and practice more skills in various fields.

**Keywords:** Communication, Social media, Elderly, Virtual space

## INTRODUCTION

At present, the rate of social media use by the elderly tends to increase. Social media use by the elderly stems from many factors, whether a social dimension, culture, and mental factors such as using social media to communicate, acknowledge daily social situations, entertain, relax, to adjust themselves to the surrounding society by exchanging information and updates to catch up with surrounding people and to communicate with family members, cousins, and friends so that they can live in the society happily. In contrast, the elderly also uses social media to escape from sadness. In addition, social media use is a mechanism to adjust to the change of modern society driven by technology. The purpose of social media use is not only to communicate but also to include social and cultural factors. That is to say, the social media is the tool for socialization.

The number of elderly people in Thailand has become an "Aging Society" (Population Aging) since 2021. According to the forecast of the population of Thailand during the years 2010 - 2040, it indicates that the proportion of young and working-age population tends to decrease. While the

proportion of the elderly population tends to increase continuously from 13.2 percent in 2010, increasing to 32.1 percent in 2040. Back to 2017, it can be counted. It was the year that the proportion of the elderly population increased from about 12.7 percent of the total elderly population to 17 percent of the elderly population. It can be seen that the elderly is a population that is constantly expanding. In addition, the average life expectancy of the population is increasing in Thai society. Therefore, dealing with the aforementioned situation is essential for planning to develop and give priority to promoting the quality of life of the elderly which leads to self-aware know how to keep up with society appropriately. Due to changes in lifestyle patterns and behaviors of the elderly in everyday life. In the past, the elderly tended to do outdoor activities. Socialize with others based mainly on direct communication but now the elderly use “social media” to communicate more as shown in the 2022 household information and communication technology usage survey (Quarter 1), NSO stated that in 2022, the Internet usage rate among the population aged 60 years and over with internet usage as high as 52.5%.

As mentioned above, it is clear that social media has played a vital role for older adults at present. The uses of social media become a more important thing in everyday life and each day the information in social media is tons of data and the contents are a very powerful impact on people who used it both positively and negatively. In addition, an important starting point for the use of social media by the elderly caused chatting with friends, family members, and acquaintances. Communication can reduce loneliness and decrease isolation as well. However, loneliness is a factor in the quality of life among older adults when using social media which provides a new dimension of communication for older adults to connect and maintain social relationships with others. Moreover, the association between social media communication with close social ties and loneliness among community-dwelling older adults. The relationships among social media communication are associated with lower levels of loneliness through social contact and perceived social support is partially mediated by social contact.

Thus, the need for technology use in older adults helps them to reduce social isolation. In addition, Mobile technology-based applications not only help families to stay connected but also link older adults to resources in all information that is important for life and encourage physical and mental well-being. The use of social media addresses cognitive, visual, and hearing needs, and increase media use self-efficacy in older adults, particularly helpful during necessary social distancing of self-quarantine during the COVID-19 pandemic. This is the most important reason for transforming the communication of the elderly by using creativity and using it with more skills to become a media literacy user.

## **OBJECTIVES**

1. To present the new pattern of communication of elderly in social media uses
2. To analyze the behavior and skills of using social media for the elderly and applied to promote the use of media among the elderly.

## **LITERATURE REVIEW**

- **Transforming Communication**

From studies on this concept, it is important in terms of acting as a model of communication that help to develop conflict resolution leading to strengthening relationships and also improves communication power to achieve the quality of life for both the personnel asserts their own needs and help others to solve their problems to support them to achieve desired outcomes. The main of the model is to create a positive professional and social culture. The process of these model for communication focus on learning and doing to build collaborative and creative working environments. Gil-Clavel,



Zagheni & Bordone (2022) studies about transformation that changed rapidly in online world impact to online environments that cultivate meaningful social relationship. This process called “digitalization” that leading to creates challenges and opportunities. On the other hand, unequal access to digital technologies and heterogeneous levels of digital literacy may amplify existing inequalities. Some group of people access to digital resources that help compensate for lower levels of social capital and serve as equalizer and reduce overall inequalities in social support aspect.

In addition, Swartz (2011) noted that transforming communication of the elderly is more satisfied with communicating with people through technology than face-to-face meetings as they used to.

Qusay AI-Maatouk et al. (2020) indicates that major social media use that is frequently examined is continuous connectivity and its value it provides to improves communication and learning consist of five main motives about learners to interact were recognized: sycophantic, excuse making, functional, relational, and, most important to the current research, participating justifications. According to Sarac & Aslan-Tutak (2017) noted that share knowledge self-effectiveness more accurately describes the belief an individual must be able to efficiently exchange information. To obtain this belief, an individual should be persuaded to possess real-world knowledge in value distribution and then the necessary skills to deliver this information. Research regarding both offline and online information sharing indicated that sharing knowledge self-effectiveness is a significant forecaster of knowledge-sharing behavior, particularly from an online perspective. Meanwhile, the sign of a deficiency in sharing knowledge related to the self-effectiveness of users who access the online world.

- **Social media**

- Definition of social media**

- The use of social media is widely used in modern times. Because it can be easily accessed, convenient, and fast in searching for information and another channel can be used to exchange ideas, views, and attitudes. Therefore, social media has both benefits and impacts on users and society. There are many different definitions as follows:

- Thitsaphum cited Boyd & Ellison (2007) about the meaning of social networking media as the basis for individuals to show personal information with any person who is connected to the public and groups that can be linked to each other. Social media is also a type of technology on the internet where users can share stories, express opinions, information, and experiences. The information can be communicated in many ways. For example, text, images, or video clips. Supoj Larprattana (2000) said that social media is a mass media that has important features that can be used to immediately respond to the target group. It is flexible, fast, and can be adjusted at any time, as well as Thitphoom Ratanawijarn (2011) gave a view on social media as a new type of mass media that combines people and media that can be immediate feedback between receiver and sender and can convey the news to the audience continuously and consistently at the same time. Jiraporn Srinak (2013) defines social media as a tool for communication. This is often a two-way communication. The giver and receiver of information interact with each other. Especially among the elderly whose behaviors, patterns, and purposes of using social media are not solely for communication or information consumption but also use the media for a social meaning beyond individual objectives. This is usually a two-way communication with the interaction between the sender and receiver of information, such as using media to entertain, expressing thoughts, emotions, feelings, and creating acceptance, etc. Therefore, the definition of social media above is mainly focused on the meaning of “social media” as a tool used to communicate for sending and receiving information between each other. The interesting definitions above are different from the definition of social media in social science which defined “Social media” as one of the tools of a social mechanism that allows the elderly to express their opinions, feelings through language, and symbolic expressions and it is also a space for exchanging experiences between

people. In addition, Qusay AI-Maatouk et al. (2020) gave the Definitions of social media have changed continually with a potentially improved characteristic to meet user specifications and demands.

### **Benefits and impact of social media**

The use of social media is widely popular in modern society because it is a channel that easily accessed information. Such as ideas, views, and attitudes are exchanged from the data gathered. There are many benefits of social media as follows

▪ ***Social media can easily access information in various aspects without monopolizing information.*** Because it is a two-way communication channel, information providers and information recipients can interact or express opinions that are consistent or have different opinions. It helps the participation of people in society on public issues.

▪ ***Social media is an economical, convenient, and fast communication channel*** It is easy to exchange information, knowledge, or brainstorm ideas to develop or extend new knowledge.

▪ ***Social media is a channel where users can present their works*** such as articles, photos, and video clips. knowledgeable and entertainment media This may or may not generate revenue for the presenter.

▪ ***Social media are channels for public relations or notification of both urgent and non-urgent disasters***, such as public relations for aid agencies infected with the Coronavirus 2019, and natural disaster alerts. accident notification, etc.

However, although social media has many benefits to users as mentioned above social media also has a penalty on social media users, society, and people around them as well. the study found that the negative effects of social media are as follows:

(1) ***Privacy:*** social media can access information easily. Make information published on social media become public media by default, such as posting messages or photos in the Facebook application. If the person who publishes the information does not set privacy settings, other people, whether friends or not friends on Facebook will be able to access those messages or photos directly. You can also transmit information from one person to another, so if social media users are not careful in disseminating information There may be people who do not wish to use that information in the wrong way or reuse the information which can harm the owner of the information (Rakkiat Panchart, 2017).

(2) ***Conflicts:*** social media consists of up-to-date information. The dynamic of information exchanges swiftly and quickly to keep up with the situation. As a result, users have a new perspective or attitude that has changed. The published information may not be impartial. It can cause impacts on thoughts, emotions, and feelings, and create conflicts in society (Rakkiat Panchat, 2017).

(3) ***Unreliability:*** an information in social media needs to subscription before access. Users need to fill in personal information. such as name, surname, date of birth, and email address to be able to access that information, so users may not know that the personal information that has been entered will be kept confidential or will be used in a way that may cause damage to the informant (Tantikon Chuenkasem, 2019)

Kanyarat Hongvoranan & Arisara Waicharoen (2017) cited Nilawan Panitchroongruang (1997) explained that communication between the elderly and family members can be divided into 4 main groups: 1. Groups with satisfaction with information for use in adaptation (Orientation Gratifications); Satisfaction with the use of information to connect with their networks (Social Gratifications) 3. The group with satisfaction in the process of utilizing information to maintain their own identity (Para-Social Gratifications) 4. The group who are satisfied with the process of using the information to reduce or ease emotional tension or for self-protection (Para-Orientation Gratifications), in which the various forms of communication above are considered characteristics of the elderly group who have adapted to

new media technologies. It's an enthusiastic group. Have the desire to learn new things look for a challenge to enhance life experience and have a positive outlook on themselves Want to develop themselves to have a modern idea and do not want to be old by age.

According to the study of social media usage among different age groups, it was found that the use of social media in each age range has different patterns. Objectives and behaviors in use are different. including social, economic, cultural, and mental factors Different beliefs can influence how such media is used. Like the elderly group today, the rate of using social media is constantly increasing. Therefore, if the elderly lack knowledge and understanding about using social media safely, creatively, and knowingly May have consequences that negatively affect themselves and others.

- **Elderly**

According to the data from Situation of the Thai Elderly Report in 2021, an aged society means a society with a population aged 60 years and over, accounting for more than 10 percent of the total population. And are moving to an aged society completely by the year 2023, that is, there are more than 20 percent of the total elderly population. This situation affects the elderly both individually and socially: they need to become more dependent on others. Especially the working-age group who take on the burden of taking care of the elderly in an increasing proportion per person. The working age group has to work harder. As a result, the elderly has to live alone or some may be abandoned, and lead to psychological problems. feel lonely and lack self-esteem.

Meanwhile, the situation of the aging society in Thailand also has social impacts on the economy and the structural system related to the welfare system for the elderly. This makes policy planning something that the state should give priority to. Therefore, the important and necessary thing for the elderly that the state should support is Utilizing the skills and experiences of the elderly Including the promotion of health for the elderly to have good health. able to help themselves as well as promote media access Through digital technology and develop social media skills for the elderly to be self-aware media literate and able to keep up with society.

### **The meaning of the elderly**

Definitions of being an elderly person in different social contexts inevitably give definitions that are not the same Both in terms of physical, mental, and social changes. The official definition of the meaning of "elderly" in Thai society states that the elderly means a person who has Thai nationality and is 60 years of age or older. As for the meaning in terms of Thai culture and society, there is no fixed age for that person. Therefore, it can be called an elderly person. Most often it is defined as having a positive meaning, that is, "aging" is intensity. On the other hand, the reflection of older people in the past has implications of increasing age along with increasing knowledge and experience.

In addition, the definition of the elderly is another dimension that reflects personal characteristics with degenerated bodies. Resulting from gradual natural changes in the body, such as organs and cells of the body that deteriorate with age wrinkles on the skin, blurred vision, less energy Hair turns white, etc. At the same time, those who do not take good care of their health use the body too hard Eating in excess or eating unhealthy food Will cause disease to deteriorate, causing the body to deteriorate like a person with a natural deterioration of the body (Sitthiphan Sunthorn et al., 2018), while the definition of the meaning of the World Health Organization states that "elderly" is a word that cannot be defined as dead Because each country has different criteria for determining the age. In a country with advanced technology and medical science, there is a tendency for the country's population to have a healthy body. therefore, determined that People aged 65 and over are senior citizens. Or defining the meaning according to physical condition, such as women between 45-55 years old and men between 55-75 years

old. but also, to assess the condition of strength and physical changes of individuals that are different in each context and area of residence including other aspects of assessment.

However, the image of the elderly in modern times is no longer slow or outdated elders. People need to adjust accordingly to be able to live happily. Because of this, many elderly people do not give up on time and focus on developing themselves as valuable people. have a good quality of life which is consistent with the concept of being a quality aging person as will be mentioned in the following

- **Active aging**

This concept is a process aimed at creating opportunities for oneself. to have good health Participate in the socio-economic and have security in life able to elevate the quality of life of individuals from birth to death This concept was initiated by the World Health Organization in the late 1990s to improve the quality of life of the elderly worldwide and set it as a goal to be achieved. As well as being used as a solution to the problem of increasing the aging population around the world (Priyanong Donghong, 2015), just like Thailand, which has become another country that has become an aging society since 1997-2005 due to the decrease in the birth rate of Thai people and their longer lives.

From this situation, the demographic structure has changed. within the next 10-20 years and will become Therefore, the elderly will be the main group of the population in the future that will affect the country's economic and social development, causing the state to be more likely to bear the burden of social and health services of this age population. Therefore, Thailand must be prepared and deal with the problems that will follow by adjusting the negative attitude that people in society see the elderly as having poor health. little benefit highly dependent on others Including the application of the concept of quality aging (active aging) to be applied to the context of Thai society. to reduce the dependency rate among the elderly and encourage them to live their lives to their full potential.

The World Health Organization (WHO, 2002) defines active aging as an appropriate process leading to health (health). (Sutthichai Jitaphankul, 2011, cited in Suwinee Wiwatpanich). "Basic needs or "need-based" view, indicate that the elderly as passive targets, has changed to a "rights-based" view, in line with the United Nations' fundamental principles for older adults. consisting of the principle of liberty (independence) the principle of participation (participation) receiving care (care) achieving self-satisfaction (Self-fulfillment) and dignity (dignity) by realizing the equal rights of people (Lek Sombat, Sasipat Yodpetch, Thanikan Sakdaporn, 2011 cited in Wandee Pokkul, 2006).

Sasipat Yodpetch (2010) defined the term Active Aging as the elderly who have the potential to engage in activities that benefit themselves, their families, communities, and society by using their skills and knowledge. Existing abilities and Wisdom. While the 2013 Situation of the Thai Elderly Report identifies the meaning of the term Active Aging by using the Thai word "Phuttha Palung", referring to the elderly who have activities with society, community, economy, culture, politics, and governance. work meanwhile Society needs to create job opportunities. Including finding ways to reduce obstacles preventing the elderly from accessing opportunities to have a stable job. (Foundation of the Institute of Gerontology Research and Development, 2016)

The definition of quality aging (Active Aging) according to the definition of the World Health Organization. Mainly focusing on social factors, namely participation in social activities. Having good relationships with family, friends, communities, etc. While the context of Thai society has defined the meaning of the word "Active Aging" which mainly focuses on the physical health of the elderly and their ability to take care of themselves.

In summary, the overall meaning of Active Aging is the participation of the elderly. Being a part of the family, community, and society and using their potential as a power to help others and society. Including being able to rely on yourself and live a meaningful life with human dignity that is equal to other age groups in society.

- **Virtual space**

The reason of why people shown and hided ourselves because the true self is one of the essential parts of people's self-concept and identity, but it is difficult to expressed in face-to-face communications. For social media uses, people can express what they intrinsically think and believe with fewer concerns about others disapproval and judgements.

In the post COVID world, virtual reality has replaced face-to-face communication in humans with significant impacts on social connectivity (Mitzner, Stuck, Hartley, Beer, & Rogers, 2017). For example, seniors can interact with each other within a three-dimensional environment with access to virtual field trips like a museum visit with their old friends. Various forms of easily affordable and accessible technologies provide a safe environment for seniors to be informed about healthcare, and to engage in social interaction while remaining in a safe environment. For instance, watching television alone might foster new health related information, but reduce the level of social engagement, while emails, video calling, or text messaging might foster it by removing distance between adults. Long-distance communication through e-mail or phone is particularly helpful in sustaining relationships among older adults. For example, many older adults living geographically distant from their grandchildren have extensive phone and e-mail communication, with high levels of emotional satisfaction, compared with individuals communicating in-person only (Holladay & Seipke, 2007). However, some older adults perceive e-mail communication to be lacking the personal touch that they experience using phone calls or letters (Dickinson & Hill, 2007; Lindley, Harper & Sellen, 2009)

In this study, the sociodemographic characteristics of the elderly in Bangkok and other factors influencing the social media adaptation of the elderly are shown and proven. However, low educational levels, difficult living conditions, the lack of government support policies, and necessary attention from communication service providers limit the digital access of the elderly. Therefore, the research team proposed policy implications to improve media literacy for the elderly and expand their adaptability in the developing and transforming the pattern of communication in social media uses for elderly in virtual space.

## **METHODOLOGY**

This study used mixed methodology, both quantitative and qualitative research. The study was carried out in the form of Research and Development.

The first step (research) is the collection of data from the sample both quantitatively and qualitatively.

The second step (development) is the use of data from research studies to design and develop training activities in the form of social academic services under the project "Elderly Communities for Use of Social Media wisely" by applying the results from the intervention to develop into a curriculum. "Empowering the elderly to use social media safely, creatively and knowledgeably"

The structure of activities is a workshop that focuses on experimentation, thinking, doing, and exchanging lessons together. The members who participated in the training consisted of elderly people living in Bangkok, representatives from the 6 district offices, scholars, students, and civil society.

The main activity used was a discussion on "Current use of online media among the elderly" with an emphasis on exchanging common experiences. Group discussion activity "Sure before sharing, yes or no, sure or not" and a sub-activity to raise awareness about media literacy, namely, the elderly activity - media literacy (5 questions, tools of media literacy). and the last activity is the Workshop activity "Creating an online community between generations to use media safely, creatively and wisely" by

doing activities together between senior citizens and students who are technology volunteers. To jointly experiment as creative media makers through TikTok (intergenerational collaboration).

### **Measurement Instruments and Data Collection**

The quantitative studies used the method of collecting data from questionnaires that were developed from the concept of online media skills. Results from studies lead to creating a curriculum in the safe, creative, and informed use of online media. Therefore, the study focuses on the skills of consumption, analysis, production, and participation in the use of media. Including the development of questions that are consistent with the conceptual framework of social support (Social support) that affects the online media usage behavior of the elderly. consisting of material support emotional support information support and support for social interactions. The scoring criteria in the questionnaire were divided into 4 levels: very high (4), very high (3), slightly (2), and not at all (1).

The questionnaire used in this study, The confidence test of the questionnaire was conducted. By using Cronbach's Alpha coefficient, which from the questionnaire was used to experiment with a representative sample of 39 elderly people, it was found that the confidence coefficient of the concept of online media skills was 0.96 and the concept of social support is 0.92. It can be seen that the alpha coefficient is between 0.92 – 0.96, indicating that the questions are internally consistent at a very good level.

Qualitative Education Study by going to the field to study in-depth information about online media usage behavior social networks in the use of media impact on quality-of-life problems, needs, and suggestions from the group of the elderly and related parties to jointly design and develop a guideline to promote the use of online media appropriately for the elderly. The data was collected in the form of in-depth interviews. Group Discussion and Observation The issues used in the qualitative data study were general information of the participants in the focus group about online media use experience, i.e., type of online media used, usage patterns, frequency, and duration of use. usability, perspective on the benefits of using media, and problems encountered from using online media including issues concerning the understanding of the elderly towards "online media"

### **Samplings**

Collecting data from elderly dwellers in six districts of the Bangkok Metropolitan Area (BMA): Thawi Watthana, Samphanthawong, Nong Khaem, Bang Kapi, Sathon, and Bangsue.

The population used in this quantitative study was elderly people aged 60 years and over who had experience using social media for at least 1 year, whose household registration was in Bangkok. Total of 400 people

The population used in this qualitative research was the elderly living in the six groups of Bangkok mentioned above. The study population was selected by purposive sampling and snowball sampling according to the same characteristics as quantitative research. The study was conducted from a population of 5 people in each district, a total of 30 people.

### **Data Analysis**

#### *Quantitative research*

The data were analyzed from the questionnaire's confidence analysis by using Cronbach's Alpha coefficient and descriptive statistics such as mean, standard deviation (S.D.), median (median), and quartile range. (Interquartile Range), percentage (Percentage), etc. There is also a follow-up to support the implementation of activities in the operational stages after the promotion and development. Data

were collected from questionnaires, interview forms, and group discussions about the operational results of activities to compare the results before and after the implementation.

### *Qualitative research*

A content analysis was conducted from the data obtained from field recordings. with and without participation in in-depth interview Audio file is extracted and compiled in open code After that, data is classified, analyzed, interpreted, and given meaning. To transform raw data into information that shows ways to develop online media usage patterns to promote the quality of life and learning of the elderly.

## **RESULTS**

### **Quantitative results**

#### *Information on Social media skills*

According to the results of the study of information on social media use skills in all 4 areas, namely consumption skills analytical skills of consumers becoming producers, and the skills of participating consumers. It was found that the respondents had overall consumption skills at a high level. The total mean was 2.50. The skill that the sample had the most was neutrality without bias in receiving information from social media. with an average of 2.69 in terms of analytical skills in the overall picture is very criterion The mean was 2.64. The skill that the sample had the most was avoiding information from useless social media. with an average of 2.90, while the skills of consumers who become producers In the picture are included in a small criterion. The total mean was 2.25. The skill that the sample had the most was not passing on information that is not true or information that defames a person's reputation. with an average of 2.71. The picture is included in a small criterion. The total mean was 2.18. The skill that the sample had the most was expressing opinions and responding to various issues with polite language in online spaces. with an average of 2.70.

### **Qualitative results**

#### **1. Social media usage behavior of the elderly**

The beginning of the use of social media for the elderly Data from the study found that the beginning of the use of social media of the elderly. Most of them are from family members who persuade, assist, and support in accessing different types of social media. The perspective on social media Data from the study revealed that the elderly had an opinion on the direction of using social media. Based on the experience they have experienced.

Meanwhile, the skills needed to use social media for seniors are critical thinking to be able to discern facts. And if they do not live with a family with children, it will be another factor that causes the elderly to make a wrong decision. In this regard, social media has both advantages and disadvantages. It depends on the user whether to use it in any form. If used beneficially, it will benefit positively. on the contrary, If used in the wrong way, it will be punished. However, an interesting point of view regarding the use of social media among the elderly is the definition of age that is not tied to age. But it is defined through adaptive behavior in the use of media.

The pattern of data uses from the study revealed that the elderly mainly uses social media to communicate with family members, friends, and those around them. Including use for work and use for Study for knowledge, develop yourself.

Social networks and social support Data from the study found that the elderly have social networks that support and help in terms of information. And the use of social media, including family members, friends, communities, and surrounding communities. In addition, the elderly also receives social support. In the form of exchanging information from children and friends, making it possible to get to know a variety of information both in terms of protection from the media and the use of media correctly, appropriately, and beneficially, so social networks Whether it's family, friends or people around you who know it, it's an important helper that facilitates and encourage the elderly to use social media appropriately.

### **Perspectives on the elderly's experience of using social media**

#### **▪ Safety**

The experience of using social media among the elderly There are good experiences and bad experiences. Most of the experiences resulted in fear of the elderly. dare not use the media It's usually a bad experience. which is insecure in that online space Most often from unknown people. and mainly from online channels which if used carelessly Lack of reflection on sources of information would easily become victims. and exchange views. The reason why the elderly become victims of the online world comes from 2 main factors, which are the factors that come from the elderly themselves and social factors from the external environment.

The first factor is that the elderly has assets, savings, and stable financial status. Resulting in the risk of being the target group of criminals. In addition, being an elderly person who is quite old affects the thinking system reflecting on information Causing carelessness, easily frightened, including a way of life attached to the house but not attached to society of some elderly people who are isolated Rarely spend time in socializing with friends and not interested in receiving information

The second factor is that criminal groups use psychology to tend the elderly to believe and obey by building trust. Create friendly, good-speaking words until the elderly finally gain trust and belief.

Therefore, surveillance and prevention of dangers to the elderly Therefore, it is necessary to support the whole person. and promote a safe environment for older people to use media to reduce the risk and negative impacts that may occur to the elderly that lead to physical, mental, and property insecurity, most of which the elderly have the same viewpoint. which sees that the most important way to prevent and avoid being a victim of using social media is to start with oneself. By thoroughly examining the information received. and do not share personal information in public areas online Including helping each other in family groups, friend groups, and groups of people around them in admonishing. and send information that is a warning that may occur. Cheung and Yin (2018) noted that when the elderly using social media affect to their online attitudes to have variance experiences and consequences that affecting interpersonal interaction pattern in an exceptional manner.

#### **▪ Creative**

Regarding the creative use of media, it was found that the elderly used social media to create information both as media producers and media producers. and as a disseminator of information Most of the information that the elderly tends to pass on is useful information. Do not cause harm to others and from reliable news sources If unsure of that information, it will not be forwarded. meanwhile, the creative use of social media by the elderly can be divided into 2 forms: the use of media for self-development and the use of media to generate jobs and income in daily life. Many seniors want to use social media as a tool and a channel to earn extra income for themselves. By bringing the knowledge and skills that they have to use to their advantage. which causes pride (Self-esteem) in the elderly. It is also a good relationship in the family. make family members empathize Help and support each other.



In addition, the use of media to generate income. also makes the elderly learn self-improvement and practice more skills in various fields.

- **Media Literacy**

From the interview Talk to seniors about media literacy issues. The question of how to verify what kind of information is reliable invites discussions on how to enable the elderly to use the media wisely in which the elderly share interesting experiences about “How to determine what kind of information is trustworthy?”

Elderly has a variety of ways to verify information received from social media. Whether it is studying to find more information from mainstream media especially television and searching for more information on the internet Including bringing information to consult Talking to family members, friends, and close people, as well as taking the information that has been taken into consideration for self-reflection. by using the experience and considering the reasonableness of the information. The study of information on the use of social media among the elderly was to find a common approach to develop and encourage the elderly to use media safely, creatively, and wisely. The data obtained from the elderly were given in-depth interviews and focus group discussions.

## **DISSCUSSION**

Transforming of communication in social media uses for the elderly in online space has been changed in 3 ways: 1. Transforming is a change in text style. The language used in communication 2. Transferring is the exchange of information. Transfer data from people to groups and society from a close relationship to a distant relationship. 3. Transition is a change like traditional communication with face-to-face contact. to contact through the media There is a connection between the real world and the virtual world.

However, from the situation of the epidemic of COVID-19 which started in 2019, not only caused the elderly to isolate themselves from society but they are also limited in their access to virtual social events and information online. As a result, the elderly is temporarily cut off from society. lack of access to important information and a sense of alienation by default. In addition the elderly face the deterioration of their health. Illness and ability to learn change diminished. meanwhile, many elderly people are still limited in their use of communication tools and digital technologies via the Internet, including communication tools such as smartphones. Some groups of elderly people live alone or in long-term care facilities. If the elderly does not have a network to support both help and information support, including psychological support May cause the elderly to be cut off from society more. Therefore, things that should be considered and given priority to reduce the problem of increasing social distance Maybe it's not just social integration. But what should be realized is the creation of social networks in both the real world and the online world to be truly connected by breaking down the age difference and connecting people to interact more safely, creatively, and knowledgeably.

Meanwhile, the increasing number of the elderly population, Therefore, it is extremely necessary to prepare to fully cope with the aging society. Participation of older people who are interested and not interested in accepting technology, that is, the first group of seniors is a group who likes to use social media as their original capital. Also known as a group of interested seniors who are open to technology (Pro Aging Group), that is, a group of active seniors. want to develop themselves all the time as well as being interested and fond of exchanging experiences with others Give more importance to the family and society outside of self-centeredness. This group will have the potential to help the elderly who are not skilled. and not interested in accepting technology We call this group Anti-Aging Group, which is a group that does not like the change of modern technology. no media skills including fear and Lack of confidence in the use of different media, so building a network to transform

communication in the positive use of social media among the elderly is to create a network together. like a friend helping a friend Due to communication at the same age, it makes us understand each other better.

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# Topic Modeling Analysis of Webometrics, Informetrics, and Scientometrics Research Trends

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## ABSTRACT

This research is a data analytics study using the Topic Modeling method. The data modeling focused on the research trends of webometrics, informetrics, and scientometrics (WIS) published in journals indexed in the Scopus database during the past 10 years (2012-2021). The selection of research articles for analysis was conducted by searching for articles titles, abstracts, and keywords. The search terms used were “webometr\* or informetr\* or scientometr\*”. The search results yielded a total of 3,524 articles. Topic modeling approach was conducted which comprised of 3 steps: data layer, Latent Dirichlet allocation (LDA) model layer, and application layer. Findings reveal that (1) WIS research publications- There was a consistent increasing trend in the number of publications each year. Analysis of the article data classified by the country of the authors, show the highest percentage comes from India, followed by China. The top journals that published research articles on WIS were *Library Philosophy and Practice*, *Scientometrics*, and *Journal of Informetric*. (2) WIS research topics - It was found that the model with 10 topics achieved the highest Coherence score. Therefore, the WIS research was grouped into 10 topics: Citation impact-scientometrics; University rankings-webometrics; Scholarly publication’s contribution; Health, psychology informetrics; Web user analysis (retrieval, query); Scientific production and development; Research network collaborations; Knowledge analysis–scientometrics; Research trends; and Publication performance. And (3) WIS research using topic modeling- There were 530 articles that employed topic modeling which focused on scientometrics, followed by informetrics and webometrics. The WIS research utilizing topic modeling was prevalent in the field of Library and Information Science, as well as in disciplines such as Active Learning, Clinical Medicine, Music Psychology, Life and Natural Sciences, Agricultural Sciences, and Pharmaceutical Effluents. And the popular software and tools used, researchers commonly employed VOS viewer software, CiteSpace, Histcite, Bibexel, Gephi, SPSS software, STATA software, and Microsoft Excel.

**Keywords:** Webometrics, Informetrics, Scientometrics, Topic modeling, Research data

## INTRODUCTION

Scholarly publications play a crucial role in the advancement of knowledge and academic discourse. They are essential for the dissemination of new research findings, theories, methodologies, and scholarly discussions within various fields of study (Lunsford, 2016). Therefore, it is evident that academics are interested in studying scholarly publications in various disciplines and topics to gain an understanding of the status of research outputs and the characteristics of published works. These

scholars seek to identify prolific authors, the predominant subjects of study, the research methodologies employed, and the significance of the studies conducted. This is particularly important in the present day as producing academic output is an indispensable task for faculty members and researchers in universities.

Webometrics, Informetrics, and Scientometrics (WIS) are all fields of study that use quantitative methods to analyze various aspects of scholarly communication and information dissemination. Webometrics is a field of study that focuses on analyzing the content and structure of the World Wide Web as a reflection of human knowledge. This field seeks to measure and analyze the impact of web-based scholarly resources, such as institutional repositories, on the dissemination of scientific knowledge. The Webometrics ranking of world universities is one example of a webometrics analysis that ranks universities based on the visibility and impact of their web presence (Thewall, 2009). Informetrics is a field of study that uses quantitative methods to analyze the production, dissemination, and use of information in various forms, including scientific literature, patents, and online resources. This field seeks to develop models and metrics to measure the impact and effectiveness of different types of information sources (van Raan, 2004). Scientometrics is a field of study that uses quantitative methods to analyze scientific literature and to study the patterns of scientific research and communication. This field seeks to develop measures and models to assess the productivity, impact, and influence of individual researchers, institutions, and scientific fields (Hirsch, 2005). Previous research findings indicate that there is a significant number of published works that utilize WIS and bibliometrics as methods to study scholarly publications and communication. These methodologies have a direct impact on understanding the characteristics, productivity, and impact of research in specific fields (Mejia et al., 2021; Ozyurt & Ayaz, 2022; Yang, Yuan, & Dong, 2017).

Topic modeling is a widely utilized technique in the fields of natural language processing and machine learning. It enables researchers to gain access to data and extract keywords and topics from documents. Farzindar and Inkpen (2015) highlight the significance of topic modeling as a medium to uncover topics in large datasets and extract them from various types of documents, including articles and digital books. To achieve reliable and valid results, researchers often employ analysis methods such as probabilities latent analysis (PLSA), latent semantic analysis (LSA), and latent Dirichlet allocation (LDA) (Cheng et al., 2014). These methods contribute to the effectiveness of topic modeling in extracting meaningful insights from textual data.

This research, therefore, aims to analyze the research trends on WIS using the topic modeling technique. The objectives include identifying the number of published articles, determining the authors with the high publication outputs, exploring the most frequent countries of the authors, and examining the topics that are prevalent in WIS research. The findings of this study will offer valuable insights into the research trends concerning WIS, a widely adopted research technique. As a result, researchers with an interest in WIS will be able to approach their studies and research advancements from new angles by incorporating innovative methods and tools for analysis and model development. These endeavors will enhance the appeal and utility of the research, benefiting the academic community as a whole.

## METHODOLOGY

This research is a data analytics study using the Topic Modeling method. The researchers have conducted a data modeling study on WIS research published in journals indexed in the SCOPUS database during the past 10 years (2012-2021) according to the research framework (Figure 1), which consists of the following steps.

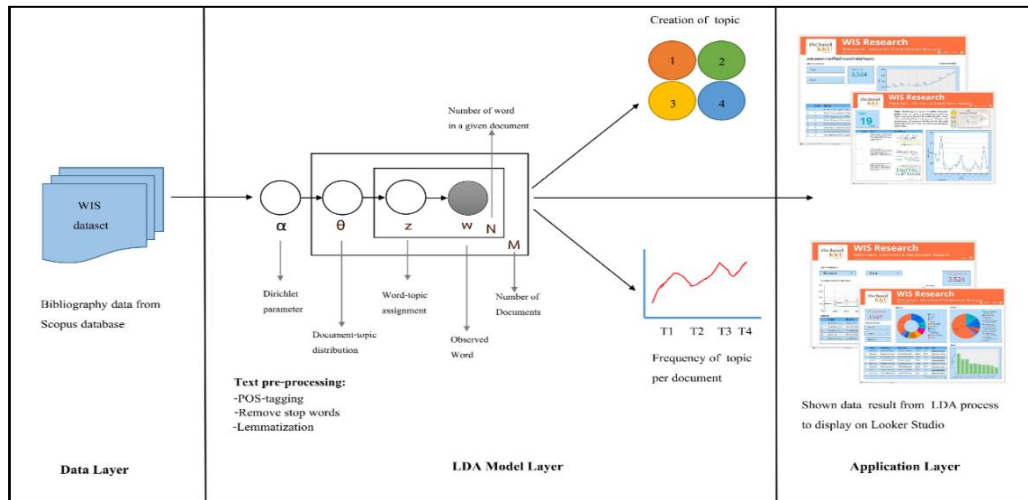


Fig. 1. Research conceptual framework on WIS topic

**1. Data Layer:** The selection of research articles for analysis was conducted by searching for articles titles, abstracts, and keywords from the Scopus database [https://www.scopus.com/search/form.uri#basic]. The search terms used were “webometr\* or informetr\* or scientometr\*”. The document type selected was “article”, and the source type was “journal”. The data range was set from 2012 to 2021, and the language selected was “English”. The search results yielded a total of 3,524 articles.

**2. LDA Model Layer:** The data analysis and grouping process utilized tools including Anaconda Navigator, Jupyter Notebook, and the Python programming language. An algorithm for topic modeling was developed following these steps and methods.

ID	Authors	Title	Abstract	Author Keywords	Index Keywords	Year	Source title	
0	Bojarić R., Petrović V., Zafrañi J., Bojarić T.	Academic Ranking of Universities in Southeast...	Ranking universities has become increasingly s...	Faculties; Indicators; Methodology; Quality	NaN	2021	Croatian Journal of Education	
1	Syich T.V., Lוצנסka T.M., Volk S.M., Diegtar ...	Areas of Improvement of Organization and Resea...	The relevance of the paper was determined by L...	Education management; Research methodology; Tr...	NaN	2021	Journal of Higher Education Theory and Practice	
2	Shi J., Fu S., Cavagnaro M.J., Xu S., Zhao M.	3D Printing Improve the Effectiveness of Fract...	Fractures of complex body parts are often seri...	3D printing; advanced medical education; fract...	acetabulum fracture; Article; bone structure; ...	2021	Frontiers in Physiology	
3	Tezel E., Topal F.E.	Holistic Analysis of Coronavirus Literature: A...	Objectives: In late December 2019, a cluster o...	bibliometrics; coronavirus; COVID-19; MISIS; SA...	animal; China; epidemic; epidemiology; human...	2021	Disaster Medicine and Public Health Preparedness	
4	Vysocňan O., Hyk V., Vysocňan O., Olřhanská M.	Sustainability Accounting: A Systematic Litera...	Although Sustainability accounting originated ...	Bibliometric analysis; Corporate social respon...	NaN	2021	Quality - Access to Success	
...	...	...	...	...	...	...	...	
3519	3520	Lee M., Park H.W.	Exploring the web visibility of words-class an...	With the rapid development of the Internet, th...	Web visibility; Webometrics; World university...	NaN	2012	Scientometrics
3520	3521	Mormal R.P., Padial A.A.	The study of fractals among ecologists (D estu...	Fractals seemed to have permeated most scient...	Ecology; Fractal geometry; Scientometrics; Spa...	article; ecology; fractal analysis; methodolog...	2012	Acta Scientiarum - Biological Sciences
3521	3522	Sarabia J.M., Prieto F., Trueba C.	Modeling the probabilistic distribution of the...	The study of the informetric distributions, su...	Gini index; Impact factor; Least squares estim...	NaN	2012	Journal of Informetrics
3522	3523	Theihal M., Sud P.	Webometric research with the Bing Search API 2.0	In May 2011 the Bing Search API 2.0 had become...	Bing; Bing API; Search engines; Webometrics	NaN	2012	Journal of Informetrics
3523	3524	Rotesa A., Yuan X.	Visualizing and mapping the intellectual struc...	Information retrieval is a long established su...	Bibliometrics; Citation analysis; Domain analy...	Bibliometrics; Citation analysis; Citation dist...	2012	Information Processing and Management

Fig. 2. Bibliographic dataset of the retrieved articles

2.1 Importing the bibliographic dataset of the retrieved articles (Figure 2).

2.2 Preparing for data processing, such as using libraries and packages like NLTK tokenizer’s “punct” package for text processing. The text was divided into sentences using an unsupervised algorithm to create a model.

2.3 POS-tagging: Part-of-speech tagging was a process of assigning tags to words in the input data based on their appropriate word types.

2.4 Remove stop words involved eliminating all the commonly used words in the English language, such as “the,” “an,” “is,” and so on, from the text data.

2.5 Lemmatization was the process of reducing the number of words to their base form based on the principles of word stem determination in the language. It utilizes the WordNet lexical database. For example, the words “run,” “running,” and “ran” were all reduced to the form “run” for further use.

2.6 Building a topic model and testing the dataset using LDA model training with the Gensim library, which is an open-source NLP (natural Language Processing) tool focused on Topic Modeling. The model training involved setting hyperparameters, while beta represented the topic-word density. The size of the groups referred to the number of documents used in each module for training, and the results obtained from the training process are shown in Figure 3.

```
In [37]: for i, topic in lda_model.show_topics(formatted=True, num_topics=num_topics, num_words=20):
print(str(i) + ": " + topic)
print()
0: 0.025**"scientific" + 0.023**"citation" + 0.017**"impact" + 0.016**"article" + 0.011**"field" + 0.009**"work" + 0.009**"analysis" + 0.008**"indicator" + 0.008**"discipline" + 0.008**"metric" + 0.006**"publication" + 0.006**"measure" + 0.006**"data" + 0.006**"scientometrics" + 0.005**"researcher" + 0.005**"social" + 0.005**"cite" + 0.004**"area" + 0.004**"academic" + 0.004**"provide"
1: 0.047**"university" + 0.017**"institution" + 0.012**"web" + 0.011**"country" + 0.010**"academic" + 0.009**"performance" + 0.008**"data" + 0.008**"ranking" + 0.008**"rank" + 0.007**"international" + 0.007**"web site" + 0.007**"analysis" + 0.006**"journal" + 0.006**"scientific" + 0.006**"webometrics" + 0.006**"base" + 0.005**"science" + 0.005**"indicator" + 0.005**"high" + 0.004**"researcher"
2: 0.061**"journal" + 0.051**"article" + 0.044**"publication" + 0.031**"publish" + 0.027**"citation" + 0.024**"year" + 0.013**"number" + 0.013**"country" + 0.012**"total" + 0.011**"period" + 0.011**"high" + 0.009**"article_publish" + 0.007**"document" + 0.007**"follow" + 0.007**"analysis" + 0.007**"contribution" + 0.007**"productivity" + 0.006**"record" + 0.006**"analyze" + 0.006**"contribute"
3: 0.039**"journal" + 0.026**"topic" + 0.019**"analysis" + 0.011**"field" + 0.010**"health" + 0.010**"base" + 0.009**"identify" + 0.009**"discipline" + 0.009**"focus" + 0.008**"scholar" + 0.008**"article" + 0.008**"psychology" + 0.007**"analyze" + 0.007**"community" + 0.006**"scientific" + 0.006**"theory" + 0.006**"science" + 0.006**"publish" + 0.006**"scientometric" + 0.005**"literature"
4: 0.024**"website" + 0.024**"data" + 0.020**"link" + 0.016**"user" + 0.011**"search" + 0.011**"analysis" + 0.010**"web" + 0.009**"provide" + 0.008**"base" + 0.008**"database" + 0.008**"include" + 0.008**"query" + 0.008**"tool" + 0.007**"service" + 0.007**"compare" + 0.007**"count" + 0.007**"model" + 0.006**"retrieval" + 0.006**"search_engine" + 0.006**"google_scholar"
5: 0.023**"scientific" + 0.022**"development" + 0.018**"subject" + 0.012**"scientometric" + 0.012**"state" + 0.011**"russian" + 0.011**"education" + 0.010**"issue" + 0.010**"identify" + 0.010**"assessment" + 0.010**"russia" + 0.010**"role" + 0.010**"scientific_activity" + 0.010**"tallerton_press" + 0.009**"problem" + 0.008**"knowledge" + 0.008**"science" + 0.008**"expert" + 0.008**"learning" + 0.008**"organization"
6: 0.052**"network" + 0.050**"collaboration" + 0.019**"analysis" + 0.019**"scientific" + 0.015**"country" + 0.012**"cluster" + 0.011**"number" + 0.009**"global" + 0.008**"institution" + 0.007**"collaboration_network" + 0.007**"increase" + 0.006**"data" + 0.006**"map" + 0.006**"structure" + 0.006**"collaborative" + 0.006**"relationship" + 0.006**"level" + 0.006**"identify" + 0.006**"analyze" + 0.006**"field"
7: 0.023**"area" + 0.016**"knowledge" + 0.016**"field" + 0.012**"analysis" + 0.011**"topic" + 0.011**"scientific" + 0.010**"identify" + 0.008**"science" + 0.008**"global" + 0.007**"literature" + 0.007**"development" + 0.007**"brazil" + 0.007**"focus" + 0.007**"brazilian" + 0.007**"conduct" + 0.006**"aim" + 0.006**"trend" + 0.006**"country" + 0.006**"future" + 0.005**"scientometric"
8: 0.028**"publication" + 0.027**"field" + 0.022**"country" + 0.016**"trend" + 0.015**"journal" + 0.014**"period" + 0.011**"article" + 0.011**"analysis" + 0.010**"area" + 0.010**"scientific" + 0.009**"literature" + 0.00
```

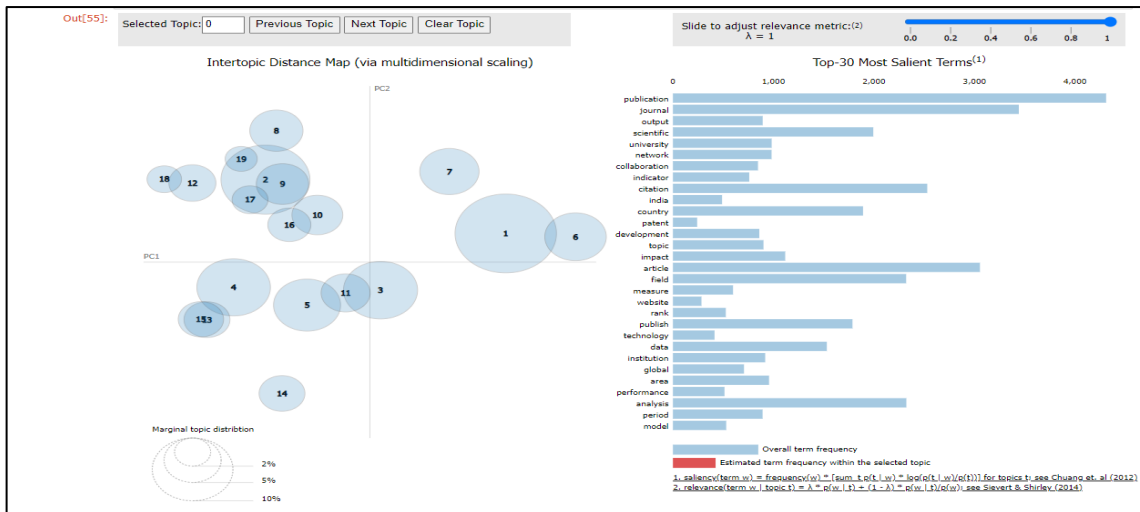
**Fig. 3. Results of LDA model training of dataset**

2.7 Prediction: This step involved testing the prediction by using the outputs from the LDA topic model. It predicted which topic a new document or input text belongs to, providing results that show the predicted topic, the weight of the topic, and the words associated with each topic, along with their respective weights (Figure 4).

topic #	weight	words in topic
0	1	0.57 0.047**"university" + 0.017**"institution" + 0.0...
1	8	0.02 0.028**"publication" + 0.027**"field" + 0.022**"c...
2	9	0.02 0.049**"publication" + 0.030**"citation" + 0.015...
3	13	0.11 0.057**"indicator" + 0.027**"measure" + 0.021**"r...
4	14	0.10 0.069**"publication" + 0.048**"output" + 0.036**...
5	15	0.06 0.016**"citation" + 0.014**"data" + 0.013**"quali...
6	16	0.12 0.042**"scientific" + 0.019**"iran" + 0.017**"sci...

**Fig. 4. Results of the predicted topics and the weight of each**

2.8 Result visualization: The pyLDAvis tool was used to display the results graphically. It showcases and the top-most salient terms, along with the count of each term (on the right side), and the inter-topic distance map (on the left side), which helps visualize the relationships between topics more clearly (Figure 5).



**Fig. 5. Visualized results present the top-most salient (right side), and the inter-topic distance map (left side)**

2.9 Topic assignment: Assigning topics to all documents was performed.

2.10 Model evaluation: The effectiveness of the topic model was measured by calculating the Coherence score. This score was computed using the test data used with the developed topic model, and the Coherence score is 0.37.

**3. Application Layer:** This layer involved presenting the data obtained from the topic modeling process using Looker Studio (formerly known as Google Data Studio). The following steps were involved:

3.1 Importing data: The data obtained from the topic modeling process was brought into Looker Studio. This could be done in various ways, such as importing data from Google Sheets or uploading a CSV file (Figure 6).

minant	Id	Contrib	Topic_Keyword	Authors	Title	Author	Ke	Index	Key	Year	Link
1	0.536599	university, institution	Bojani? R	Academic Ranking of Universities in South Faculties: Indicators	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512					
2	0.996900	scientific, developme	Sych TV, Areas of Improvement of Organization and Education manager	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
3	0.448999	field, analysis, article	Shi J., Fu J	3D Printing Improve the Effectiveness of F 3D printer: acetabulu	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512					
4	0.539499	publication, field, cou	Zhenl E., Holistic Analysis of Coronavirus Literature: bibliomet animal; CI	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8509						
5	0.472400	publication, field, cou	Vyoochan Sustainability Accounting: A Systematic U Bibliometric analysis	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
6	0.923099	publication, field, cou	Noor M.I. Aquaculture research in Southeast Asia A Climate change; Doi	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
7	0.994400	publication, output, c	Dutt B., K Scientometric study of lithium ion battery Alternative Energy;	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
8	0.537500	scientific, citation, im	Furhan T. Understanding of the relation between etl Bibliometric review;	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
9	0.425899	journal, article, publi	Kudflow P. Citation Advantage of Promoted Articles ii Digital kn: article; fo	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
10	0.320400	network, collaborati	Thavorn I A scientometric assessment of agri-food ii Bibliometric indicati	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
11	0.557600	field, analysis, article	Yang Q., Z Research progress of urban floods under c Citation analysis; CI	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
12	0.524900	scientific, developme	Maier D. Building materials made of wood waste a Building r Concrete	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
13	0.464599	field, analysis, article	Shi J., Xu i Visualizing international studies on cybers concept; cyberspace	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
14	0.267300	field, analysis, article	Xie Y., Lan Mapping maternal health in the new med Bibliomet health cai	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
15	0.425599	field, analysis, article	Yu T., Yan Scientometric analysis of disaster risk per CiteSpace data set; i	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
16	0.443500	specie, nanotechnol	locatelli F Exploring natural language processing in c Artificial Intelligence	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
17	0.374700	journal, topic, analys	Espinosa- Evolutionary analysis of international scier Bibliogra; bibliogra	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						
18	0.289099	field, analysis, article	Gao J., Li Cooperative evolution of china's excellent Cooperat biogeocho	2021	https://www.scopus.com/inward/record.uri?eid=2-i2.0-8512						

**Fig. 6. Presents imported data from topic modeling process into Looker Studio via Google Sheets**



3.2 Selecting appropriate data visualization: The suitable chart and control options were chosen to display the data. Dimensions and metrics were selected, and various configurations were adjusted according to the requirements, as shown in the example (Figure 7).

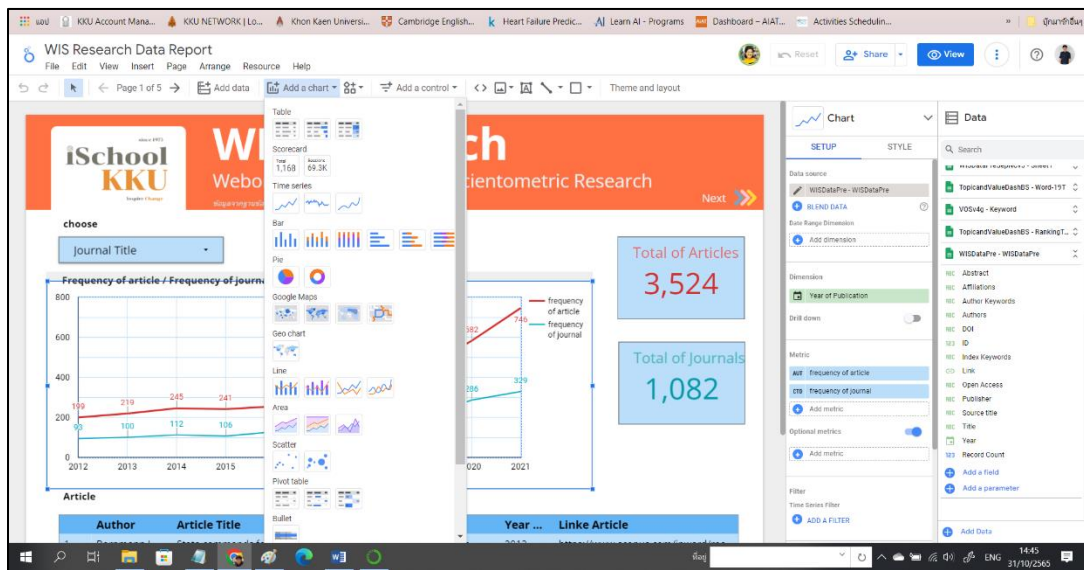


Fig. 7. Example of data visualization using Looker Studio

**RESULTS AND DISCUSSION**

The analysis of research works related to WIS published in journals listed in Scopus database between 2012 and 2021 can be summarized as follows:

**WIS research publications**

There was a total of 3,524 research articles related to WIS found in the Scopus database within the past 10 years (2012-2021). There was a consistent increasing trend in the number of publications each year, starting from 199 articles in 2012 and reaching 746 articles in 2021. Additionally, the number of journals publishing research articles on WIS has also increased, from 93 journals in 2012 to 329 journals in 2021 (Figure 8).

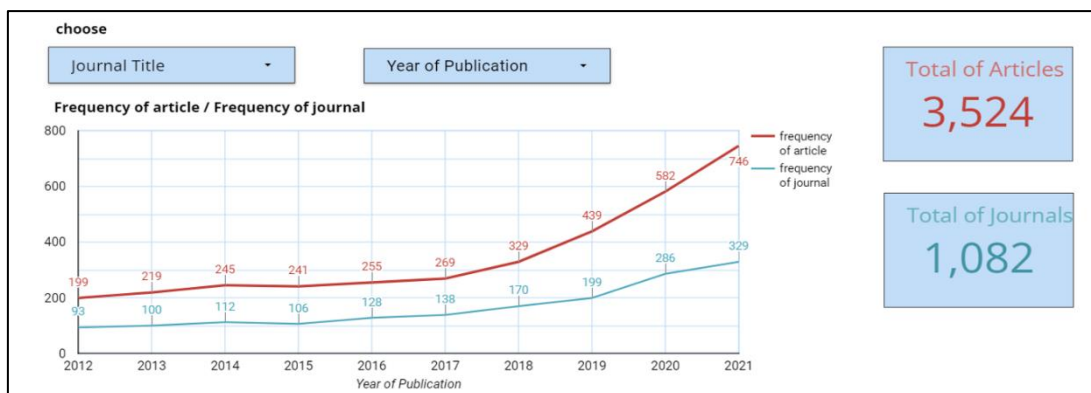


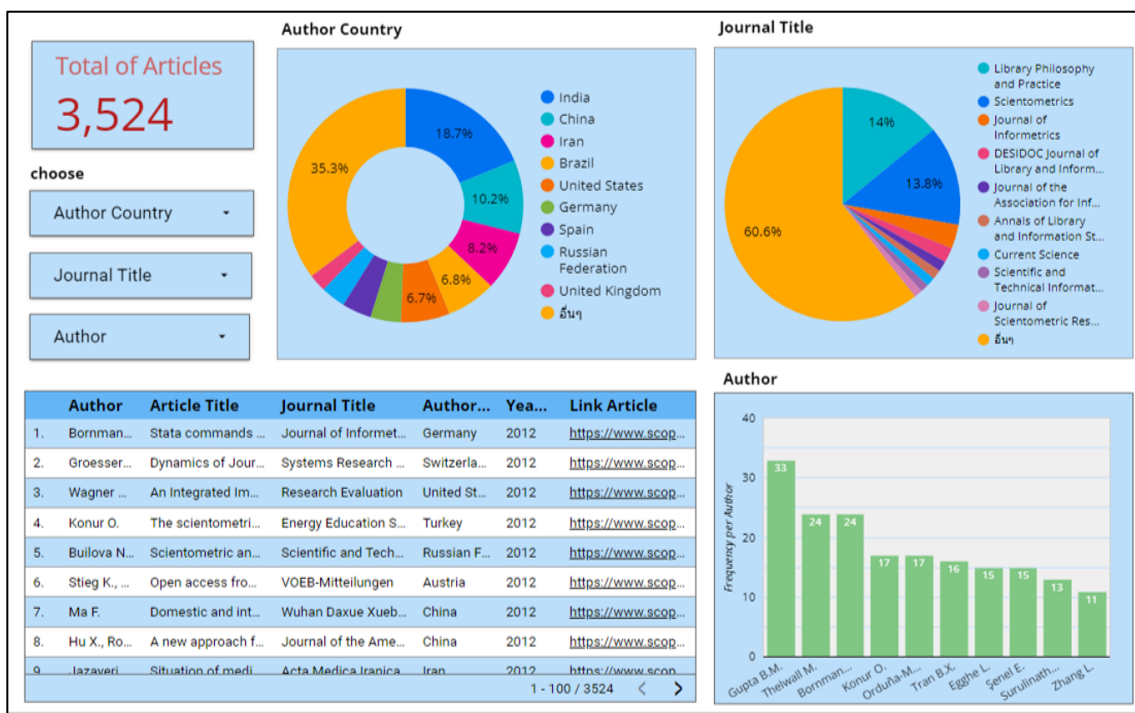
Fig. 8. Numbers of articles and journals published WIS research between 2012-2021

Figure 9 shows an analysis of the article data classified by the country of the authors, the findings show the highest percentage of articles comes from India (18.7%), followed by China (10.2%),



Iran (8.2%), Brazil (6.8%), and the United States (6.7%). Regarding the journals that published research articles on WIS, the top five journals with the highest number of publications were *Library Philosophy and Practice* (14.0%), *Scientometrics* (13.8%), *Journal of Informetrics*, *DESIDOC Journal of Library and Information Science*, and *JASIST-Journal of the Association for Information Science and Technology*. In terms of the authors of WIS research, the most prolific authors were Brij Mohan Gupta from the National Institute of Science, Technology and Development Studies, India (with 33 titles), Mike A. Thelwall from the University of Wolverhampton, UK (with 24 titles), and Lutz Bornmann from the Administrative Headquarters of the Max Planck Society, Germany (with 24 titles). However, when comparing these findings with the research results of Yang, Yuan, & Dong (2017), it is noted that European countries dominated more than half of the top 10 national rankings in the fields of scientometrics, informetrics, and bibliometrics. Nevertheless, scientometrics has been widely explored in Asia, particularly in India and China.

### WIS research topics



**Fig. 9. Analysis of research in WIS classified by author country, journal titles, and author**

Topic modeling is a technique that helps organize, understand, and summarize large amounts of textual data. LDA (Latent Dirichlet Allocation) is widely used topic modeling technique that extracts topics from textual data. However, LDA requires the user to specify the number of topics to be generated. In this research, the effectiveness of the topic modeling approach was measured using the Coherence score. It was found that the model with 10 topics achieved the highest Coherence score of 0.37. Based on this, the research articles on WIS were grouped into 10 topics: (1) Citation impact-scientometrics, (2) University rankings-webometrics, (3) Scholarly publication’s contribution, (4) Health, psychology informetrics, (5) Web user analysis (retrieval, query), (6) Scientific production and development, (7) Research network collaborations, (8) Knowledge analysis – scientometrics, (9) Research trends, and (10) Publication performance. When comparing these findings with the research conducted by Mejia et al. (2021), which explored topics in bibliometric research through citation networks and semantic analysis, it was found that the majority of bibliometric research focused on

management, public health, and sustainability. However, there was similarities in the analysis of citations and research evaluation and trends. (Table 1).

**Table 1. Comparison of the topic modeling results found in this study and the study by Mejia et al. (2021)**

Ranks	This study	Mejia <i>et al.</i> (2021)
1	Citation impact-scientometrics	Bibliometrics in management
2	University rankings-webometrics	Bibliometrics in public health
3	Scholarly publication's contribution	Citation-based indicators
4	Health, psychology informetrics	Research evaluation
5	Web user analysis (retrieval, query)	Bibliometrics in sustainability
6	Scientific production and development	Science mapping
7	Research network collaborations	Bibliometric theory
8	Knowledge analysis - scientometrics	Tech mining
9	Research trends	Bibliometrics from Spain
10	Publication performance	Global South

### **WIS research using topic modeling**

The researchers analyzed the abstracts of 3,524 articles to identify research on WIS that utilized topic modeling techniques. It was found that there were 530 articles (15.04%) that employed topic modeling. The majority of these research papers were focused on scientometrics, followed by informetrics and webometrics. It is interesting to noted that WIS research utilizing topic modeling was prevalent in the field of Library and Information Science, as well as in disciplines such as Active Learning, Clinical Medicine, Music Psychology, Life and Natural Sciences, Agricultural Sciences, and Pharmaceutical Effluents.

Regarding the popular software and tools used, researchers commonly employed VOS viewer software, CiteSpace, Histcite, Bibexel, Gephi, SPSS software, STATA software, and Microsoft Excel.

### **CONCLUSION**

This article examines the research trends on WIS published in Scopus-indexed journals between 2012-2021 using topic modeling technique. It provides insights into the scholarly publications related to WIS, including the number of published articles, journals, authors, their affiliations, and the prominent topics studied. Additionally, the study analyzes the research conducted on WIS that employs topic modeling, revealing the preferred disciplines as well as the software and tools used for analysis. In the current academic situation, where there is a substantial production of research articles across various disciplines, studying WIS remains intriguing due to researchers' need for information regarding topics and research trends in their respective fields. Conducting content analysis of a large volume of documents would have been challenging in the past, making the utilization of WIS an appealing approach.

WIS research offer various potential areas of study within the field of information science and bibliometrics. Webometrics are useful for the studies of Web's performances, such as Web impact analysis, Web presence and visibility, Web usage and user behavior, and Web content analysis. Informetrics can be an effective research approach for citation analysis, analysis of publication productivity and trends, knowledge domain analysis in specific subjects, and knowledge mapping and

visualization. As for Scientometrics, it has potential for research evaluation and impact assessment, analysis of research collaboration networks and patterns, investigating science policy and funding analysis, and exploring open science and almetrics. Based on the differences potential of WIS, It is important to consider current trends, challenges, and gaps in the literature to identify specific research questions that align with the researchers' interests and contribute to the advancement of WIS knowledge.

Topic modeling is a valuable technique used in WIS research to analyze and uncover hidden themes or topics within large collections of textual data. However, it also has certain limitations that researchers should be aware of. While topic modeling can reveal latent topics within a corpus, interpreting and assigning meaningful labels to these topics can be subjective and challenging. Researchers need to carefully analyze the generated topics and ensure they align with the underlying content. Determining the optimal number of topics to extract from a corpus is not always straightforward. Choosing too few or too many topics can lead to a loss of granularity or an oversaturation of topics, respectively. In addition, Topic modeling primarily focuses on capturing co-occurrence patterns of words within documents. It may not adequately capture more complex semantic relationships, such as hierarchical or temporal relationships, that exist within the data. Despite these limitations, topic modeling remains a valuable tool in WIS research for uncovering patterns, exploring thematic structures, and gaining insights from large textual datasets. Researchers should carefully consider these limitations and employ complementary approaches to enhance the validity and comprehensiveness of their findings.

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# Classification of Thai Buddha Images for The Days of the Week Using Deep Learning

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## ABSTRACT

This research study examines the utilization of a deep learning framework based on convolutional neural networks (CNN) for the purpose of image classification of Thai Buddha Images representing different days of the week. The main objective is to compare the performance of seven distinct CNN architectures in classifying daily birth Buddha statues. The architectures being compared include AlexNet, ResNet, DenseNet, SqueezeNet, EfficientNet, VGGNet, and GoogleNet. The dataset used consists of a total of 800 images of daily birth Buddha statues, which have been divided into a training set comprising 80% (640 images) and a testing set comprising 20% (160 images). The dataset is further categorized into 8 classes. Notably, the images in the dataset exhibit complex backgrounds. After conducting the comparison, it was determined that ResNet and VGGNet achieved the highest performance, with an accuracy of 99.3%. GoogleNet and DenseNet closely followed with an accuracy of 98.7%. EfficientNet, SqueezeNet, and AlexNet performed slightly lower, with accuracies of 95.6%, 95.0%, and 94.38% respectively.

**Keywords:** Image Recognition, Image Classification, Thai Buddha Images for The Days of the Week Using Deep Learning, Comparison of CNN Models

## INTRODUCTION

Thailand, recognized as the Buddhist Kingdom, possesses sacred artifacts that serve as reminders of the presence of Lord Buddha, fostering mindfulness of the enlightened one, the teachings (Dharma), and the monastic community (Sangha). These rich traditions have been cherished and passed down for thousands of years. Buddha images reflect the cultural and religious essence of Thailand. The daily birth Buddha images in Thailand are classified as follows: Sunday's birth Buddha image depicts the gesture of meditation, Monday's birth Buddha image embodies contemplation, Tuesday's birth Buddha image symbolizes the subduing of Mara, Wednesday's birth Buddha image represents the act of receiving alms in the morning and engaging in walking meditation at night, Thursday's birth Buddha image signifies enlightenment, Friday's birth Buddha image illustrates meditation in repose, and Saturday's birth Buddha image denotes the subduing of the Nagas. This captivating subject has piqued the interest of researchers, who aim to investigate the precise classification of daily birth Buddha images to achieve the highest level of image recognition accuracy.



**Fig. 1. The images of Buddha statues corresponding to each day of the week, from left to right, in order from Sunday to Saturday.**

(Source: <http://somdechuk.com/content-detail.php?id=165>)

Deep Learning is a technique for artificial intelligence learning that leverages multi-layered Artificial Neural Networks. It has become widely popular and finds application in diverse research domains. These applications encompass image classification and recognition, object detection, natural language processing tasks like language translation, and comprehension of sentence meanings through deep learning models such as Recurrent Neural Networks (RNN) and Transformer models. Deep Learning is also employed in audio processing tasks, including speech recognition, speech-to-text conversion, as well as sound perception, memorization, and sound pattern recognition.

The primary focus of this research is to investigate Convolutional Neural Network (CNN) architectures within the realm of deep learning for the purpose of classifying daily birth Buddha images. The main goal is to conduct a comparative analysis of seven distinct CNN architectures, namely AlexNet, ResNet, DenseNet, SqueezeNet, EfficientNet, VGGNet, and GoogleNet, with regards to their performance and effectiveness in this classification task.

## LITERATURE REVIEW

Object classification in images has a rich history that spans several significant milestones.

1. Early Developments: In 2005, PASCAL VOC introduced a dataset comprising 20,000 images categorized into 20 different object classes. This marked an important step towards advancing the field.
2. ImageNet Project: The year 2006 saw the collaboration between Fei-Fei Li and PASCAL VOC in the development of the ImageNet project. ImageNet revolutionized the field by providing a vast image database with over 14 million images and more than 20,000 categories. This resource became instrumental in training AI algorithms.
3. Recognition at CVPR: In 2009, ImageNet gained recognition by presenting a poster on Computer Vision and Pattern Recognition (CVPR) at a conference held in Florida. This acknowledgment further solidified its importance in the research community.
4. ILSVRC Competition: In 2010, the annual software competition called ILSVRC (ImageNet Large Scale Visual Recognition Challenge) was launched. It focused on the classification and detection of objects using ImageNet's vast image collection and 1,000 predefined categories. Notably, it included 90 dog breeds out of a total of 120.
5. Breakthrough with AlexNet: In 2011, significant progress was made when AlexNet achieved a remarkable 16% error rate, outperforming others in the top 5 error rate that stood at 25%. This breakthrough demonstrated the effectiveness of deep learning models.
6. Error Rate Reduction: By 2012, the top 5 error rate had significantly decreased to just a few percentage points, showcasing the continuous advancements in object classification accuracy.

7. **Growing Participation:** In 2014, the ILSVRC competition witnessed an increasing number of institutions, with over 50 joining the challenge. This demonstrated the expanding interest and involvement in the field.
8. **CNN Dominance:** In 2017, during the competition involving 38 teams, it was observed that 29 teams achieved an impressive accuracy of over 95% using Convolutional Neural Networks (CNN). This highlighted the effectiveness of CNN-based approaches in object classification tasks.

Typically, an artificial neural network comprises an input layer, hidden layers, and an output layer, forming a Multi-Layer Perceptron (MLP). However, the work presented by LeCun et al. introduced convolutional layers to the network, resulting in the emergence of Convolutional Neural Networks (CNNs). A CNN is structured with convolutional layers, pooling layers, and fully connected layers, representing the hidden layers and output layer, respectively.

- **Convolutional Layer**

Convolution is a computational technique used to calculate the output of a neural connection based on a local region of an image. The image is defined as a rectangular prism with dimensions  $W \times H \times M$ , where  $W$  represents the width and height of the image, and  $M$  represents the image's dimension. For instance, in the case of RGB color images,  $M$  is set to 3, representing the red, green, and blue channels.

During the computation in the convolutional layer, the local region is evaluated through a dot product operation with a kernel. The kernel has dimensions of  $H \times H \times K$ , where it needs to be smaller than the size of the image.  $K$  represents the number of kernels used to compute the resulting output from the convolution. This output is referred to as a Feature Map.

- **Pooling Layer**

In general, the pooling layer is inserted between convolutional layers to decrease the size of the Feature Map using methods like average pooling, minimum pooling, or maximum pooling. When the maximum pooling method is employed, it is called Max Pooling. This entails selecting the maximum value within each pooling region as a representative. The pooling operation then advances (strides) to the next area, typically moving by 2 pixels at a time, until it covers the entire Feature Map.

- **Fully-Connected Layer**

The fully connected layer plays a crucial role in object classification. In this layer, every neuron is connected to all neurons from the preceding convolutional and pooling layers. The outcome is the number of predefined classification groups, which is determined by applying the softmax function to calculate the probabilities.

- **Architecture of the Deep Convolutional Neural**

The structure of Convolutional Neural Networks (CNNs) enables the unrestricted increase of convolutional layers, leading to the creation of novel architectural designs. Prominent examples of such architectures include AlexNet, ResNet, DenseNet, SqueezeNet, Efficient-Net, VGGNet and GoogLeNet.

**Table 1. Different Types of CNN Architectures**

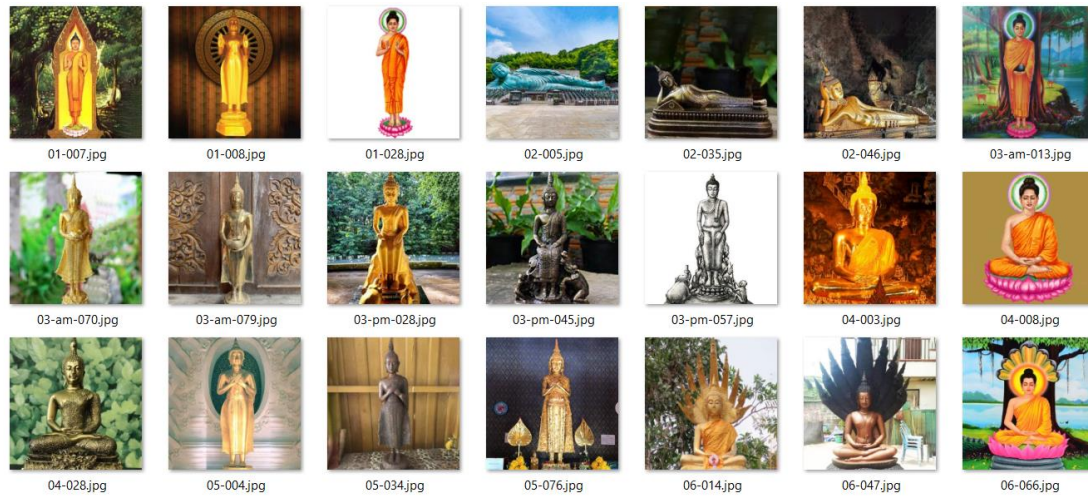
Architecture	Released	Layers	Technique	Parameters
AlexNet	2012	5	Deep Neural Network	60 million parameters
GoogLeNet	2014	22	Inception Module	5 million parameters
ResNet	2015	50	Residual Learning	27.4 million parameters
VGGNet	2015	16	Deep Convolutional Neural Networks	138 million parameters
DenseNet	2016	121-264	Dense Connectivity	7 - 33 million parameters
SqueezeNet	2016	54	Fire Module	1 million parameters
EfficientNet	2019	7 - 22	Compound Scaling	5 - 66 million parameters

## EXPERIMENTS

In this research study, the images used were resized to a dimension of 500x500 pixels. The data was divided into an 80:20 ratio to create a training set and a test set, respectively. The experiments were conducted using a GeForce GTX 1080Ti GPU with 12GB of memory. The Convolutional Neural Network (CNN) was implemented with various architectures for comparison, including AlexNet, ResNet, DenseNet, SqueezeNet, EfficientNet, VGGNet, and GoogleNet. In the comparison of processing speed among Deep CNN architectures during a test with 200 epochs, VGGNet exhibited the longest processing time, taking approximately 54 minutes. It was followed by DenseNet, which took around 30 minutes, and EfficientNet, which required approximately 27 minutes. On the other hand, GoogleNet, SqueezeNet, ResNet34, and AlexNet each took 14 minutes to complete the processing. The experimental results can be found in Table 4.

### Thai Buddha Images for The Days of the Week Dataset

The dataset includes Thai Buddha Images representing the Days of the Week, with a total of eight classes. The images were sourced from the internet, categorized, and released as a dataset on Kaggle (<https://www.kaggle.com/datasets/chakkritsaengkaew/thai-buddha-images-for-the-days-of-the-week-2565>). It is divided into a training dataset, comprising 80 images per class, resulting in 640 images, and a test dataset, consisting of 20 images per class, totaling 160 images. All the images are stored in the RGB color space. To focus solely on the Buddha statue, each image is cropped to include only the relevant area and then resized (normalized) to a pixel size of 500x500.



**Fig. 2. Sample images from Thai Buddha Images for The Days of the Week Dataset**

The dataset consists of 8 classes of Thai Buddha Images representing the Days of the Week. Due to there being two classes for Wednesday, they are further categorized as "Pang Um Bat" (Wednesday Morning) and "Pang Pa Le Lai" (Wednesday Afternoon). The data used for training in each CNN architecture is stored in the "train" folder, while the test data is stored in the "test" folder. In each architecture, the data used for training and testing is the same.

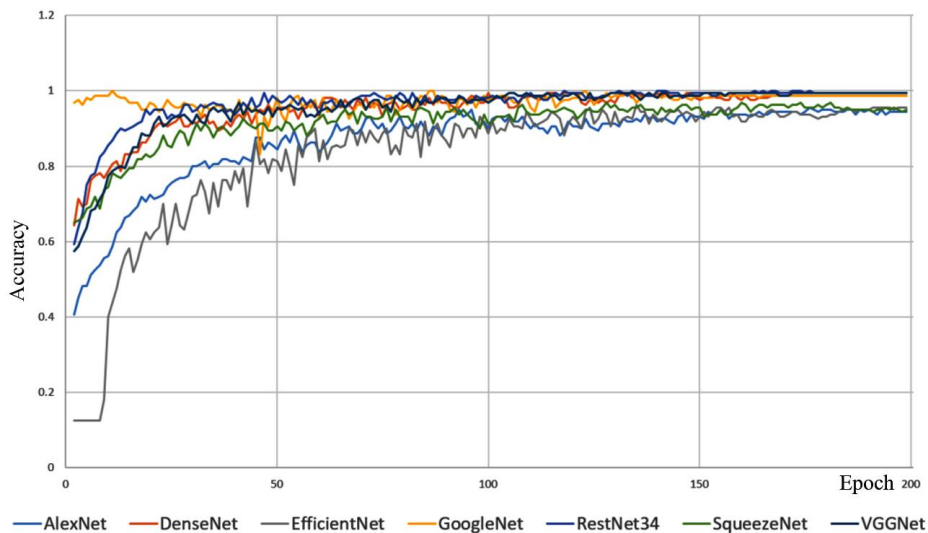
**Table 2. List of Thai Buddha Images for The Days of the Week**

Class No.	Days of the Week	Train	Test	Thai Romanization	Thai
1	Sunday	80	20	Pang Thawainet	ปางถวายเนตร
2	Monday	80	20	Pang Hamyat	ปางห้ามญาติ
3	Tuesday	80	20	Pang Saiyat	ปางไสยาสน์
4	Wednesday (morning)	80	20	Pang Um Bat	ปางอุ้มบาตร
5	Wednesday (afternoon)	80	20	Pang Pa Le Lai	ปางป่าเลไลย์
6	Thursday	80	20	Samathi	ปางสมาธิ
7	Friday	80	20	Ramphueng	ปางรำพึง
8	Saturday	80	20	Nakprok	ปางนาคปรก

## Training

In this study, the images utilized have been resized to dimensions of 500x500 pixels. The dataset is split into an 80:20 ratio, with 80% allocated for training purposes and 20% for testing. Stratified Cross Validation is implemented with 5 folds, assessing the experiment's performance using the accuracy metric. The evaluation primarily relies on the Top-1 accuracy rate. All models in this research study were trained with a batch size of 32 and 200 epochs, using an initial learning rate of 0.001. The computations were executed on an Nvidia GeForce 1080 Ti.





**Fig. 3. The learning rate of different types of CNN architectures**

For training the models of each architecture, the researchers opted for the Ubuntu Linux operating system and relied on the Nvidia GeForce 1080 Ti, which boasts 3584 CUDA cores. These hardware components were utilized alongside nvidia-docker. In their work, the researchers made use of PyTorch version 1.11.0, running on Jupyter Notebook, and employed OpenCV version 4.6.0.

### Evaluation

Upon comparing the experimental results among different CNN architectures, it was observed that the accuracy rates were comparable. ResNet, VGGNet, GoogLeNet, and ResNet achieved accuracy rates exceeding 98%. However, VGGNet exhibited the longest training time, taking 54 minutes, followed by DenseNet at 30 minutes, and GoogLeNet and ResNet at 14 minutes each. The detailed experimental results can be found in Table 4.

**Table 4: Test Accuracy comparison of CNN architectures on Thai Buddha Images for The Days of the Week dataset**

CNN Architectures	accuracy	Params	Epoch	Training Time	Model Size
AlexNet	0.943750	2,737,984	200	13.4 minute	11.3 MB
SqueezeNet	0.950000	1,266,880	200	13.3 minute	5.41 MB
Efficient-Net	0.956250	52,264	200	26.6 minute	16.9 MB
DenseNet	0.987500	8,011,648	200	30 minute	33 MB
GoogLeNet	0.987500	6,624,904	200	13.3 minute	27 MB
VGGNet	0.993700	15,254,592	200	53.3 minute	61.4 MB
ResNet	0.993750	21,816,128	200	13.4 minute	87.7 MB

**Table 5: Comparative Analysis of F1-Score Performance for CNN Architectures on Thai Buddha Images for The Days of the Week dataset**

Classes	AlexNet	SqueezeNe t	EfficientN et	DenseNe t	GoogleNe t	VGGNe t	ResNet
Sunday	0.88	0.89	0.97	1.00	1.00	1.00	1.00
Monday	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Tuesday	0.90	0.87	0.86	1.00	0.95	0.97	0.98
Wednesday (morning)	0.92	0.95	0.97	0.95	0.97	1.00	0.97
Wednesday (afternoon)	1.00	0.98	1.00	0.97	1.00	1.00	1.00
Thursday	0.90	0.97	0.98	1.00	1.00	1.00	1.00
Friday	1.00	0.97	1.00	0.97	1.00	1.00	1.00
Saturday	0.95	0.97	0.86	1.00	0.97	0.98	1.00
Average F1	0.94	0.95	0.96	0.99	0.99	0.99	0.99

The F1 Score is a unified metric that combines Precision and Recall to evaluate the performance of each predicted class. In the experiment, it was observed that the architecture with the highest average F1 Score exhibited the highest errors specifically on Tuesday, achieving an F1 Score of 93.29%. Additionally, the F1 Scores for Wednesday morning and Saturday were 96.14%, while Sunday attained an F1 Score of 96.29%. Thursday demonstrated an F1 Score of 97.86%, Friday reached an F1 Score of 99.14%, and Wednesday afternoon achieved an F1 Score of 99.29%. Finally, Monday obtained a flawless F1 Score of 100.00%.

## CONCLUSION

In this research study, various CNN architectures were evaluated using a dataset of images representing eight classes of Thai buddha images for the days of the week. The results revealed that ResNet, VGGNet, GoogLeNet, and DenseNet achieved the highest accuracy, exceeding 98%. Furthermore, the comparison of parameter counts among these models indicated that ResNet had 21,815,128 parameters, VGGNet had 15,254,592 parameters, DenseNet had 8,011,648 parameters, and GoogLeNet had 6,624,904 parameters. Generally, models with a larger number of parameters require more computational resources. Considering both the performance and parameter counts, it was observed that GoogLeNet, DenseNet, VGGNet, and ResNet exhibited the best computational efficiency in respective order.

In the library industry, the application of object detection and image recognition technology is extensive. For instance, it can be utilized for book cover recognition to retrieve information from book covers or for recognizing images related to cultural heritage information resources.

Conversely, we can employ image recognition techniques, specifically CNN (Convolutional Neural Network), for sound classification. By transforming the audio data into spectrogram images, which visually depict the sound, we can train CNNs using these spectrogram images. This allows us to leverage image recognition methodologies to recognize and classify sounds, similar to how it is done in image recognition tasks.

## ACKNOWLEDGMENT

This research was supported by the Faculty of Informatics, Mahasarakham University, Thailand.

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# Semantic Enrichment of Thai FrameNet: Generated Knowledge Graph on Pathamasambodhi

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## ABSTRACT

This study investigates the value of Thai religious literature in relation to temple murals, which mostly use a distinctive prosodic style. This style's emphasis on rhyme frequently necessitates the usage of synonyms to achieve poetic harmony. The identification of these synonymous phrases, such as those related to "Indra" or "Lord Buddha," has potential for the development of *Thai FrameNet* because the Thai language is rich in synonyms. Frame Elements, Lexical Units, and their corresponding synonyms can be included in Thai FrameNet by utilizing the Thai WordNet's synonym set functionality. The research also emphasizes how the flexibility provided by Thai case grammar, which permits the coupling of semantic functions under the same name, and the fine-grained approach to expressing Frame Elements in the original Berkeley FrameNet are compatible. This study's main goal is to rapidly extract unstructured data and create knowledge graphs that accurately represent things and their semantic relationships. Establishing a mapping procedure that incorporates significant data from encyclopedias into extracted triples can help achieve this goal by increasing the breadth and depth of the resulting semantic knowledge graph. The study also highlights the accuracy of material from online encyclopedias and offers insights into the process for establishing frames elements in the English language.

**Keywords:** Semantic Web, Knowledge Graph, Thai Encyclopedia, Thai WordNet, Thai FrameNet

## INTRODUCTION

Most Thai religious literature that serves as sources for temple mural paintings were written in a characterized prosodic style which has a rhyme-like sound. As a result, there are numerous words with similar meanings that can be used to make sentences rhyme. Thai language is distinguished by the presence of multiple words with the same meaning, known as synonyms. For example, Thao Thewathirat (“ท้าวเทวธิราช” in Figure 3 (b)) and Thao Kosi (“ท้าวโกสีย์” in Figure 3 (c)) are synonyms for the same notion 'Indra'. The same 'Lord Buddha' is Somdej Phra Sassada (“สมเด็จพระศาสดา” in Figure 3 (a))

and the Buddha Somdej Phra Sapphanyu (“สมเด็จพระสังฆราช” in Figure 3 (d)). The Thai WordNet characteristic of the synonym set can be used to aid the future Thai FrameNet (Leenoi et al., 2022). Not only can Frame Elements and Lexical Units be utilized, but also a collection of Lexical Unit synonyms.

The original Berkeley FrameNet's fine-grain approach to describing Frame Elements results in a huge number of case names, but the Thai case grammar enables us to combine the same semantic function with the same name.

The primary objective of this research is to proficiently extract unstructured data with the purpose of generating knowledge graphs, thereby effectively illustrating entities and their corresponding semantic relationships. The central aim is to establish a mapping process, connecting the key information obtained from *encyclopedias* with the extracted triples, with the ultimate intention of enhancing the overall depth and comprehensiveness of the semantic knowledge graph.

The subsequent sections of this paper are structured as follows. Section 2 provides a comprehensive overview of previous research pertaining to *FrameNet* in the context of the Thai language, as well as emerging web technologies employed for information dissemination through encyclopedias. In Section 3, a domain-specific scenario is presented, elucidating the methodology employed for knowledge graph generation. Moving forward, Section 4 examines both the reliability of web-based encyclopedia information and the methodology employed for defining Scenario Elements in the English language. Finally, Section 5 offers a concise summary of the key findings of this study.

## **BACKGROUND AND RELATED WORKS**

### **Thai FrameNet**

The FrameNet (Baker et al., 1998; Ruppenhofer et al., 2016), a lexical resource based on a Charles J. Fillmore theory, Frame Semantics (Fillmore, 2008), is one of the important resources for Natural Language Processing. It has been applied to Q&A systems, word sense disambiguation, machine translation, and information retrieval. Also, the FrameNet database, reflecting the facts of the valency description as evidenced in corpus, is what lexicographers should be aware of when compiling the dictionary entry.

### **Web Technology and Encyclopedia**

In the realm of encyclopedias, web technology has had a significant impact (Kraus et al., 2021). The development of web technology has altered traditional print-based encyclopedias, resulting in the birth of web-based encyclopedias like Wikipedia. These platforms have gained popularity as a result of their emphasis on collaboration and open knowledge. They do, however, have difficulties with regard to accuracy and dependability. Information is now easily accessible to users thanks to advancements in web technology that have transformed content generation and accessibility. Information retrieval has improved because of search engines and semantic technologies, yet biases and the need for information literacy are still issues. In conclusion, web technology has changed the way encyclopedias operate and has significant future repercussions, including the ubiquity of knowledge and the role of artificial intelligence.

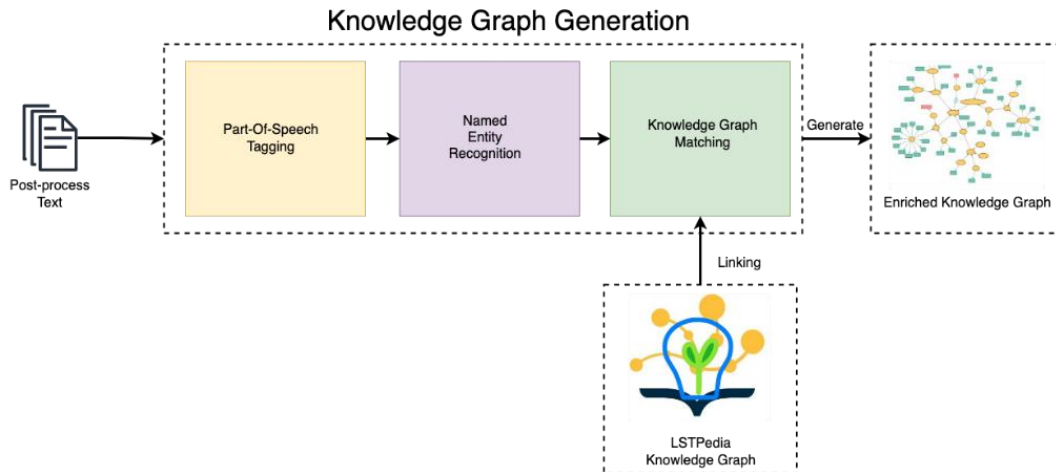
### **Knowledge Graph**

Through an extensive literature review, it is evident that the generation of ontology-linked knowledge graphs (KGs) from unstructured texts remains a significant and ongoing research challenge. Particularly, when dealing with biomedical scientific literature and computational ontologies within the biomedical domain (Rossanez et al., 2020), additional complexities arise. The utilization of ontology-linked KGs has the potential to greatly enhance the integration and comprehension of research findings by facilitating structured data queries.

## METHODOLOGY

### System Overview

The knowledge graph generation system, employed within this research, adopts the Thai Knowledge Graph Generation approach, as visually demonstrated in Figure 1. The entire process is delineated into three key steps, each of which is explained below.



**Fig. 1. A Pipeline of Knowledge Graph Generation Process**

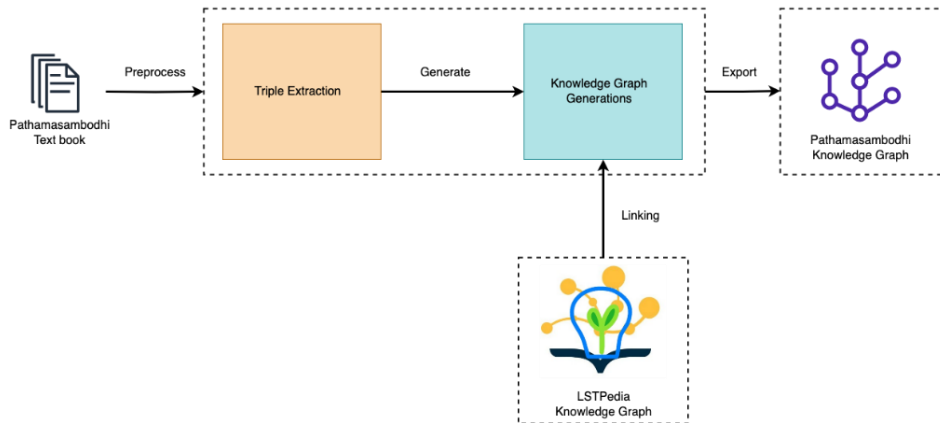
First, the network text analysis is divided into two processes. (a) The data preprocessing step involves the use of natural language processing (NLP) techniques to extract significant individual terms from the text corpus. Additionally, low-frequency terms are filtered out to ensure the focus on relevant information. (b) The next process is the co-occurrence network generation, where a graph is constructed based on the frequency of term co-occurrences obtained from the process (a). This network provides a visual representation of the relationships between terms within the corpus, enabling a deeper understanding of the underlying connections.

Second, the following step is the triples generator, which involves generating subject-predicate-object premises in the form of triples. These triples serve as the foundation for further graph generation and analysis.

Lastly, the KG generator takes the triples from the previous process and enriches them with ontology links sourced from public open data. This step enhances the understanding of the topic by incorporating additional contextual information. The result is a KG that can be further analyzed and explored.

### A Scenario through FrameNet

To demonstrate the use of FrameNet, we chose a cultural domain that depicts a religious festival in Thailand in which monks walk down the hill to beg for food on the eleventh lunar month's full moon. The scenario of the Lord Buddha's descension from heaven, a chapter in the Pathamasambodhi, is used in this paper to examine the genesis of this celebration (Laulertvorakul, 2003).



**Fig. 2. Employing the Knowledge Graph Generation Process for Pathamasambodhi**

The story of Pathamasambodhi, a literary work on the Life of the Lord Buddha, was written in 1844 by Somdech Phra Maha Samanachao Krom Phra Paramanujitjinoros, the seventh Supreme Patriarch of the Rattanakosin Period. It has twenty-nine chapters. Since ancient times, mural paintings depicting the life of the Lord Buddha have been painted in practically every vihara in Thailand. As shown in Table 1, this paper selected excerpts of content in a chapter in the Pathamasambodhi. Table 1 (a) explained the scenario of the Lord Buddha's descension from heaven in Thai and translated in English at Table 1 (b).

**Table 1. Excerpt of the scenario of the Lord Buddha's descension from heaven in Pathamasambodhi**

<p>“ครั้นถึงวันอัสดขุขุขุขุขุขุขุขุขุ ๑๑ สมเด็จพระศาสดาทรงปวารณาพระศาสนาแล้ว จึงตรัสบอกแก่สมเด็จพระอมรินทรว่า “ดูกรท้าวเทวาธิราช ตถาคตจะลงไปสู่มนุษยโลกในเวลาวันนี้” ท้าวโกสิยกันตุมิตรซึ่งบันไดทิพย์ทั้ง ๓ ลงจากเทวโลก คือบันไดทองอยู่ ณ เบื้องขวา บันไดเงินอยู่ ณ เบื้องซ้าย บันไดแก้วประดิษฐานอยู่ในท่ามกลาง แลเชิงบันไดทั้ง ๓ นั้นลงจดพื้นภูมิภาคปฐพีที่ใกล้เมืองสังกัสนคร แลคีรีขันธ์ไฉนเบื้องบนจดยอดเขาพระสิเนรุราชอันเป็นที่ตั้งแห่งดาวดึงษ์พิภพ แลบันไดทองซ้ายขวานั้นเป็นที่ลงแห่งหมู่เทพดา อันจะตามส่งเสด็จ บันไดเงินนั้นเป็นที่ลงแห่งหมู่พรหมทั้งหลายอยู่ฝ่ายวามภาค บันไดแก้วในท่ามกลางนั้นเป็นทางเสด็จสมเด็จพระสัมมาสัมพุทธเจ้า แลพระบรมครูเสด็จสถิตยเหนือ ยอดเขาพระสิเนรุราช ทอดพระเนตรเครื่องสักการบูชาแห่งเทพดาทั้งหมื่นโลกธาตุ แลหมู่มนุษย์จะนับบมิได้เต็มไปทั่วจักรวาล เสด็จขึ้นประดิษฐานณคีรีขันธ์บันไดในท่ามกลางหว่างเทพพรหมบรรพาส อันแวดล้อมเป็นบริวาร ก็ทรงแสดงพระขมกปาฏิหาริย์อีกครั้งหนึ่ง จึงพระคัมภีร์จนาจารียกัถ์กล่าวสารพระคาถาว่า ขมกปาฏิหาริย์สุส เปนอาทิอรรถาธิบายว่า “พระสัมมาสัมพุทธเจ้าทรงกระทำพระขมกปาฏิหาริย์โดยประการเป็นอันมาก เนื้อความก็เหมือนนัยกล่าวมาแล้วแต่ครั้งก่อน”</p> <p>(a) The scenario of the Lord Buddha's descension from heaven in Thai</p>
<p>“On the full Moon day of the eleventh lunar month, after the Lord Buddha had finished the ecclesiastical ceremony to mark the end of the rains-retreat, he told the God Indra, "My Lord, I will return to the world of humans today." So, Indra conjured up three divine staircases from the Heavenly Abode—a gold staircase on the right, a silver staircase on the left and a crystal staircase in the middle. The ends of the staircases reached the ground, close to the City of Sangassanagara and the tops of the staircases were at the Sineruraj Mountaintop, which was the location of Tavatimsā Heavenly Abode. The right and the left sides of the gold staircase were for the deities who would accompany the Lord Buddha from heaven. The silver staircase was for the Brahmas who were on the left side. The crystal staircase was the path for the Omniscient One. The Great Teacher, standing on top of the Sineru Mountain, saw the divine offerings of the deities in the 10,000 elemental worlds and of countless numbers of human beings all over the universe. He came to stand at the top of the crystal staircase amidst the deities who were his followers. He performed the Twin Miracle once again Phra Gantharacanācārya cited the gatha, yamakapāṭiherassa, which can be explained as follows. The Omniscient One performed the Twin Miracle at great length. The description is the same as described before.”</p> <p>(b) The translated scenario of the Lord Buddha's descension from heaven in English</p>

## Information Extraction in Encyclopedia

In the translated contexts, the essential terms were recognized by *Named Entity Recognition (NER)* as Dependency Parsing. To comprehend the NER parsing result, those essential terms are highlighted with curved parentheses in the following sentences.



Fig. 3. The “full Moon day of the eleventh lunar month” Page in LSTPedia.org<sup>10</sup>

“On (the full Moon day of the eleventh lunar month), after (the Lord Buddha) had finished the ecclesiastical ceremony to mark the end of the rains-retreat, he told (the God Indra), "(My Lord), I will return to the world of humans today." So, (Indra) conjured up (three divine staircases) from the Heavenly Abode-a (gold staircase) on the right, a (silver staircase) on the left and a (crystal staircase) in the middle. The ends of the staircases reached the ground, close to (the City of Sangassanagara) and the tops of the staircases were at (the Sineruraj Mountaintop), which was the location of Tavatimsā Heavenly Abode. The right and the left sides of the gold staircase were for the deities who would accompany the Lord Buddha from heaven. The silver staircase was for the Brahmans who were on (the left side). The crystal staircase was the path for ( the Omniscient One). (The Great Teacher), standing on top of the Sineru Mountain, saw the divine offerings of the deities in the 10,000 elemental worlds and of countless numbers of human beings all over the universe. He came to stand at the top of the crystal staircase amidst the deities who were his followers. He performed (the Twin Miracle) once again Phra Gantharacanācārya cited the gatha, yamakapaññherassa, which can be explained as follows. The Omniscient One performed the Twin Miracle at great length. The description is the same as described before.”

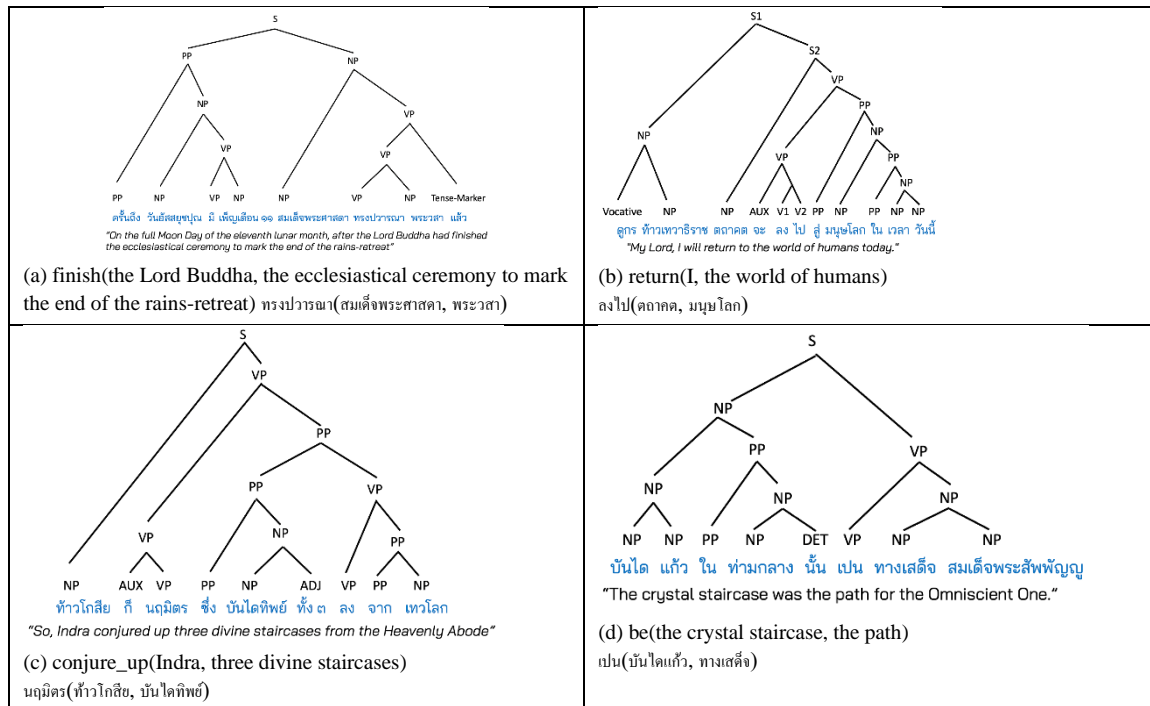
## Triple Extraction using Thai Encyclopedia

Utilizing linguistic structural theory with word segmentation and grammatical functions as a starting point, parse tree construction builds a sentence from smaller units into a larger unit until it is a complete sentence. The serial-verb structure is one of the outstanding syntactic elements of Thai grammar. In example sentence Figure 3 (b), when a Thai single verb “ลง” (to drop) is juxtaposed with another single

<sup>10</sup> Language and Semantic Technology Encyclopedia (LSTPedia) <https://lstpedia.org/about/wiki/detail/189>



verb “ไป” (to go) which means ‘go down’, for instance, the two words must first be integrated into one unit before being combined with other units.



**Fig. 4. Four parsing results using dependency parser**

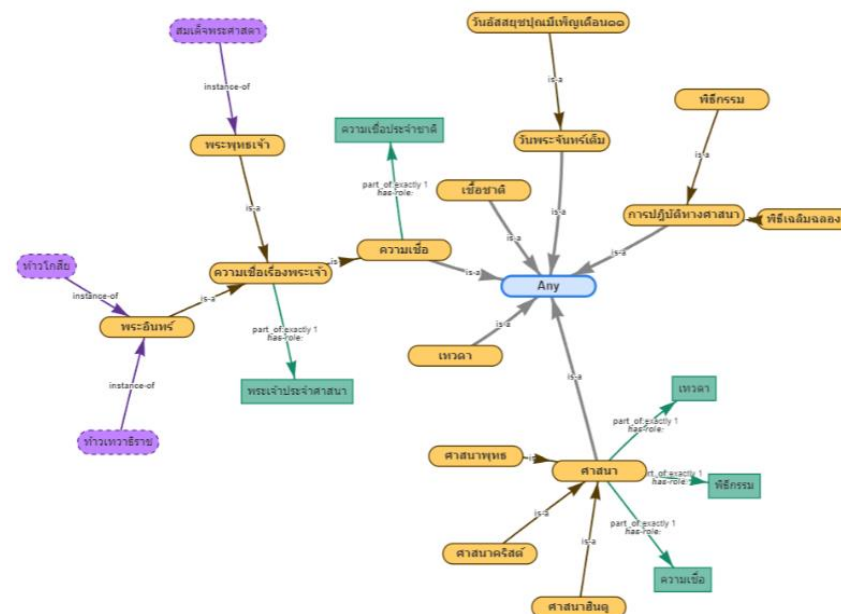
Output from dependency parsing. The sentence tokens are at the bottom, and the parts of speech that go with them are at the top. The line-connections display the tokens' indicated dependents. It is required to distinguish the grammatical function based on this experiment. Next, we link the syntactic connections between words. Finally, predicate logic must be applied to the linguistic structure. As shown in Figure 3, there are four parsing results. To point out how the dependency parser can extract and annotate the POS, the explanations in each result are described in the following.

- Figure 3 (a) shows the sentence “On the full Moon day of the eleventh lunar month, after the Lord Buddha had finished the ecclesiastical ceremony to mark the end of the rains-retreat”. The parsing shows the royal language, in this case it is required to distinguish the semantic denotation and the grammatical function. Next, we link the syntactic connections between words. Finally, predicate logic must be applied to the linguistic structure.
- Figure 3 (b) shows the sentence “My Lord, I will return to the world of humans today.”. The parsing shows the serial-verb structure is one of the outstanding syntactic elements of Thai grammar., In this case, when a Thai single verb “ลง” (to drop) is juxtaposed with another single verb “ไป” (to go) which means ‘go down’, for instance, the two words must first be integrated into one unit before being combined with other units. The last step is to convert the example phrases into predicate logics.
- Figure 3 (c) shows the sentence “So, Indra conjured up three divine staircases from the Heavenly Abode”. The parsing demonstrates that the construction of a parse tree begins with word segmentation and grammatical operations and progresses from smaller units to larger units until it is a complete phrase. We use language structural theory in this situation.
- Figure 3 (d) shows the sentence “The crystal staircase was the path for the Omniscient One”. The parsing shows that Thai literature, especially religious literature, is frequently written in uncommon

writing styles or using rare terms. There is still no way to create an autonomous tree parser. Linguists should be cautious in these situations as well. For example, “เป็น” (to be) and “สมเด็จพระสัมมาสัมพุทธเจ้า” (the Omniscient One) are uncommon writing style and rare word, respectively. In this case, we choose the Thai WordNet synonym set to resolve.

### Representation in Generated Knowledge Graphs

Following the process of semantic enrichment, the crucial entities pertaining to the scenario of the Lord Buddha's descension from heaven in Pathamasambodhi were effectively associated with corresponding entities, which share the same name, within the knowledge graphs available in LSTPedia. The resultant outcome of this semantic enrichment is illustrated in Figure 5, where the enriched knowledge graph representing the selected scenario is visually presented within the knowledge graph construction platform known as CD-OAM (Takhom et al., 2021).



**Fig. 5. Knowledge Graphs Representation of the scenario of the Lord Buddha's descension from heaven in Pathamasambodhi**

### DISCUSSION

The reliability of web-based encyclopedia information is a major concern due to its reliance on user-generated content, the potential for bias and vandalism, and the lack of centralized editorial control. The dynamic nature of web-based encyclopedias poses challenges in maintaining accurate and up-to-date information. Measures such as content guides, volunteer editors, and automated systems have been implemented to address reliability issues, but the problem remains complex. Users should critically evaluate information, research multiple sources, and develop digital literacy skills to tackle these challenges effectively.

The way to define Scenario Elements in English with fine-grain making a lot of case names, while the case grammar of the Thai language allows to combine the same function with the same name. The English frame elements: ‘Agriculturist’, ‘Assailant’, ‘Assessor’, ‘Creator’, ‘Deliverer’,

'Destroyer', 'Driver', 'Invader', 'Killer', 'Speaker', 'Surrenderer', etc. can be replaced by 'Agent' in Thai: <https://framenet.icsi.berkeley.edu/fndrupal/luIndex>.

Since Thailand is part of the Indianized states of Southeast Asia. Thus, Thai was influenced by Pali and Sanskrit religious beliefs and literature. Words that refer to the same concept have multiple word forms called synonyms. This problem can be solved by using Thai WordNet.

## CONCLUSION

In conclusion, this research highlights the significance of Thai religious literature, particularly those serving as sources for temple mural paintings, which are predominantly written in a distinctive prosodic style. This unique style, characterized by its rhyme-like sound, often leads to the presence of multiple words with similar meanings, or synonyms, in order to achieve poetic harmony. The existence of synonyms in the Thai language, such as various terms denoting 'Indra' or 'Lord Buddha,' provides valuable insights for future attempts like Thai FrameNet. Leveraging the Thai WordNet's synonym set characteristic can aid in the development of Thai FrameNet, enabling the incorporation of Frame Elements, Lexical Units, and their corresponding synonyms. Furthermore, the study highlights the compatibility between the original Berkeley FrameNet's fine-grained approach to describing Frame Elements and the Thai case grammar, as both enable the combination of semantic functions with the same name. Ultimately, this research contributes to the primary objective of proficiently extracting unstructured data to generate knowledge graphs that effectively illustrate entities and their semantic relationships. The proposed mapping process facilitates the integration of key information from encyclopedias into the extracted triples, enhancing the overall depth and comprehensiveness of the resulting semantic knowledge graph. Moreover, the study emphasizes the reliability of web-based encyclopedia information and presents the methodology employed for defining Scenario Elements in the English language.

To improve the credibility of web-based encyclopedias, use community mechanisms such as peer reviews, discussion forums, and content guides to increase accuracy. Volunteer editors and administrators also play an important role in monitoring and verifying information. Advances in technology, such as algorithms and artificial intelligence, should detect misinformation and fake content. However, limitations still exist and further research is needed to remove bias and manage large amounts of information. These initiatives demonstrate a commitment to reliability, but ongoing evaluation and refinement are essential to adapt to the ever-changing challenges of the digital information landscape.

## ACKNOWLEDGEMENT

This paper is partially supported by linked open data, Thai Wikidata are kindly provided by LSTPedia.org, Language and Semantic Technology Laboratory (LST), National Electronics and Computer Technology Center (NECTEC) that provided insight, necessary resources, and expertise that greatly assisted the research.

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# Transforming Information for Thai Encyclopedia

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## ABSTRACT

This article explores the concept of digital transformation (DT) and its profound impact on organizations. It highlights the potential of DT in revolutionizing the field of encyclopedias, making them more accessible, interactive, personalized, and continuously updated. The transition from Web 2.0 to Web 3.0 represents a paradigm shift towards user empowerment, privacy, and collaboration. Semantic Web technology provides a foundation for intelligent systems through semantic representation and knowledge graphs. By combining Web 3.0 and Semantic Web Technology, a more intelligent and user-centric web ecosystem can be created. In the context of Thai language processing, the utilization of Natural Language Processing (NLP) techniques, specifically for information extraction, is crucial. This paper aims to digitize Thai information by leveraging pre-trained NLP Model tools and semantic web technology to develop a Thai encyclopedia. The approach employs the Linguistically-Oriented Gaussian Neural Networks or 'Longan' as the NLP model to extract unstructured data and generate interconnected knowledge graphs. The effectiveness of this approach is demonstrated through the Suvarnabhumi case study, showcasing Longan's ability to extract important information. The findings highlight the potential of this approach in facilitating the development of the DT pipeline for the Thai encyclopedia and enhancing knowledge management processes.

**Keywords:** Information extraction, Knowledge graph, Linked open data, Natural language processing, Encyclopedia

## INTRODUCTION

*Digital transformation (DT)* refers to the process of integrating digital technologies and innovative strategies into all aspects of an organization to fundamentally change how it operates and delivers value to its stakeholders (Kraus et al., 2021). It goes beyond adopting new technologies; it encompasses a holistic shift in mindset, culture, processes, and business models to leverage the full potential of digital advancements. In this article, we explore the essence of DT, its core components, and the profound impact it has on organizations across industries.

DT brings numerous opportunities to enhance the world of encyclopedias. It enables greater accessibility, interactivity, collaboration, personalization, and continuous updates, revolutionizing the way knowledge is shared, accessed, and experienced. Especially, to embrace DT, encyclopedias (Ebert & Duarte, 2018; Pentzold et al., 2017) can evolve into dynamic, user-centric, and ever-evolving platforms that cater to the diverse needs of today's learners and knowledge seekers.

The transformation from Web 2.0 to Web 3.0 represents a paradigm shift towards user empowerment, decentralization, privacy, interoperability, and enhanced user experiences. It brings about a new era of ownership, control, trust, and collaboration in the digital landscape.

The *Semantic Web technology* provides a powerful foundation for intelligent systems by enabling semantic representation, data integration, contextual understanding, reasoning, and the creation of knowledge graphs or *KGs* (Berners-Lee et al., 2001).

By combining the strengths of both Web 3.0 and Semantic Web Technology, we can create a more intelligent, decentralized, and user-centric web ecosystem that leverages the power of semantic representation, reasoning, and collaboration to enhance the capabilities of intelligent systems and deliver more value to users.

Using NLP for extracting information in Thai language is essential for efficient and accurate processing of Thai text data (Dansuwan et al., 2001). It enables language understanding, handling of unstructured text, efficient data processing, language-dependent applications, informed decision-making, addressing language-specific challenges, and cross-lingual integration. Embracing NLP in Thai language processing empowers businesses, researchers, and users to leverage the vast amount of information available in Thai and derive meaningful insights from it.

This paper aims to digitize Thai information by utilizing a pre-trained *Natural Language Processing (NLP)* model, named *Linguistically-OrieNted GAussian Neural Networks* or “*Longan*” coupled with semantic web technology. The intention is to leverage these advanced technologies to facilitate the development of a Thai encyclopedia, titled “*LSTPedia*”<sup>11</sup>. By employing pre-trained NLP Model tools, which are designed to process and analyze Thai language data. Furthermore, the integration of semantic web technology enables the creation of a structured and interconnected knowledge base, ensuring the effective organization and retrieval of digitized Thai information. The main approach involves the utilization of pre-trained NLP Model tools and semantic web technology, which collectively contribute to the realization of a sophisticated Thai encyclopedia, serving as a resource for knowledge preservation.

The rest of the paper is organized as follows: Section 2 presents an in-depth analysis of the relevant literature pertaining to the topic at hand. Section 3 delineates the fundamental methodology employed to effectively transform unstructured data into an encyclopedia, with specific emphasis on the Suvarnabhumi case study. Section 4 focuses on a detailed case study pertaining to the Suvarnabhumi Study, elucidating the utilization of a dependency parser for the generation of knowledge graphs. Finally, Section 5 encapsulates the paper by providing a comprehensive conclusion.

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<sup>11</sup> Language and Semantic Technology Encyclopedia (LSTPedia), <https://lstpedia.org/>

## BACKGROUND AND RELATED WORKS

*Knowledge Graph Generator* is a methodology revolving around the conversion of unstructured text into semantic knowledge representation or knowledge graph. To achieve this, various *natural language processing (NLP)* techniques are utilized. Specifically, *Part-Of-Speech (POS)* tagging is employed to assign grammatical labels to words in the text, facilitating the identification of the subject, predicate, and object. Additionally, *Named-Entity Recognition (NER)* is applied to identify and classify named entities within the text, further aiding in the extraction of meaningful information. By leveraging these NLP techniques, the unstructured text is transformed into structured semantic knowledge, enabling the construction of a comprehensive knowledge graph. This methodology serves as a foundation for extracting and organizing valuable information from unstructured text sources (Rossanez et al., 2020).

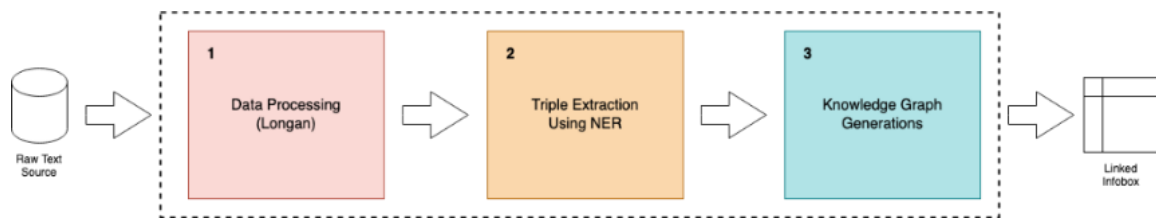
*Information Extraction in Thai* presents several challenges that necessitate the development of language-specific techniques and resources. Thai words often exhibit multiple meanings, requiring context-based approaches for accurate disambiguation. The absence of explicit word boundaries in Thai poses difficulties in word segmentation, impacting entity and relationship identification. Additionally, informal language and spelling variations in Thai text further complicate entity recognition and overall comprehension. The limited availability of language resources, including annotated corpora and lexicons, hinders the development of IE systems. To address these challenges, researchers focus on context-based disambiguation, improving word segmentation algorithms, handling informal language variations, and creating language-specific resources tailored to Thai's unique characteristics. These efforts aim to enhance the accuracy, robustness, and applicability of Thai IE systems (Leenoi et al., 2022).

*Linked Open Data and Knowledge Resources* provides insights into the broader concepts of Open Government, Open Government Data, and the significance of information openness and collaboration (Bauer & Kaltenböck, 2011). By incorporating Open Data and potentially applying *Linked Open Data* principles, the process of transforming information for the Thai Encyclopedia can benefit from a wider range of data sources, promote collaboration, and enhance the accessibility and interlinking of information.

This paper, therefore, presents an approach to the digitization of unstructured data into a comprehensive and semantically rich knowledge representation encyclopedia. The approach centers around the utilization of a pre-trained NLP Model known as *Longan*. By leveraging the capabilities of Longan, which has been trained and optimized for processing and analyzing textual data, the paper aims to convert unstructured data into a structured and interconnected knowledge base. Longan's advanced linguistic analysis techniques, including word segmentation, part-of-speech tagging, and entity recognition, enable the extraction of meaningful information and the identification of key entities and relationships within the unstructured text. This process facilitates the creation of a semantic knowledge representation that encompasses a wide range of topics and domains.

## METHODOLOGY

As shown in Figure 1, a Digital Transformation Pipeline for Thai Encyclopedia, and the descriptions in each process are as follows.

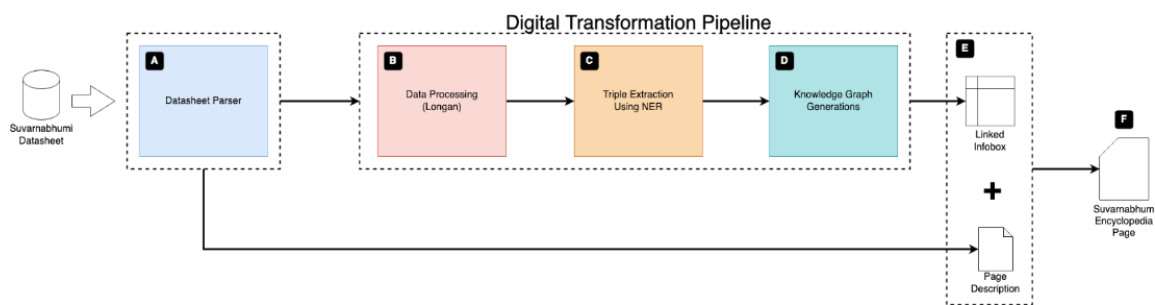


**Fig. 1. Digital Transformation Pipeline for Thai Encyclopedia**

First, in the initial stage of data preprocessing, the application relies on a pre-trained *Natural Language Processing (NLP)* model, called the Longan model for parsing *Part-of-speech (POS)* tags. This step involves assigning grammatical tags to the words in the text.

Second, the triple extraction phase utilizes both *named entity recognition (NER)* and POS tags acquired from the preceding step. These techniques enable the extraction of entities and the relationships that exist between them within the unstructured text.

Finally, the knowledge graph generation step employs the extracted triples from the previous stage to enhance the understanding of the relationships between entities found within encyclopedia pages. As a result, an interconnected InfoBox is produced, which encapsulates significant facts about the entities as well as their associated relationships.



**Fig. 2. Digital Transformation Pipeline adapted to the Suvarnabhumi case study.**

In the methodology employed in these publications, Figure 2 Demonstrates the Digital Transformation Pipeline that has been adapted to the Suvarnabhumi case study. The pipeline comprises six distinct key processes, each of which is explained in detail below.

- *The (A) part* is The Datasheet Parser is used to read each row of Suvarnabhumi case study datasheet and pass it into the Digital Transformation Pipeline. Additionally, in the forthcoming (E) part, we will provide an explanation of the online encyclopedia system.
- *The (B) part* involves the utilization of a pre-trained NLP model called "Longan" to perform various NLP processes. These processes include word segmentation and POS tagging, which are essential steps in preparing the text data for the NER process in the (C) part.
- *The (C) part* is the process of triple extraction involves utilizing the Named Entity Recognition (NER) process to identify named entities from the descriptions of the Suvarnabhumi case study. This step enhances our understanding of the relationships between each named entity within the currently processed encyclopedia page.
- *The (D) part involves* transforming the triples obtained in the previous (C) section into the RDF format of a knowledge graph. The utilization of a knowledge graph serves to enhance the understanding of the relationships between various entities in the Suvarnabhumi case study, such as the example of Pak Nam Chumphon being located in Chumphon as shown in Figure 3.



- The (E) part entails the encyclopedia management system, which combines the Linked Infobox results from the Digital Transformation Pipeline with the original encyclopedia page descriptions to create linked encyclopedia pages.
- The (F) part presents the results of the Suvarnabhumi case study encyclopedia pages, which encompass the descriptions of the page content and the linked InfoBoxes.

```

1 <?xml version="1.0" encoding="utf-8"?>
2 <rdf:RDF
3   xmlns:ex="https://aimht.lstpedia.org/"
4   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
5 >
6 <rdf:Description rdf:about="https://aimht.lstpedia.org/ปากน้ำชุมพร">
7   <ex:LOCATION>อำเภอเมืองชุมพร</ex:LOCATION>
8   <ex:LOCATION>จังหวัดชุมพร</ex:LOCATION>
9   <ex:LOCATION>คลองท่าตะเภา</ex:LOCATION>
10  <ex:LOCATION>เมืองชุมพร</ex:LOCATION>
11  <ex:LOCATION>จีน</ex:LOCATION>
12 </rdf:Description>
13 </rdf:RDF>

```

**Fig. 3. Knowledge Graph of Digital Transformation Pipeline adapted to the Suvarnabhumi case study in RDF format**



**Fig. 4. The “Kao Talu” Page in LSTPedia.org<sup>12</sup>**

## A CASE STUDY

### Domain Knowledge in Suvarnabhumi Study

A platform for extracting knowledge graphs from historical data of Suvarnabhumi silk road to generate an online encyclopedia (KGen for historical data); it is a platform that uses Thai descriptive text stored

<sup>12</sup> Language and Semantic Technology Encyclopedia (LSTPedia) <https://lstpedia.org/about/wiki/detail/184>

in the cultural archives' data structures to convert them into correlated data with a semantic knowledge base. The platform uses technology and tools specifically designed to analyze Thai natural language, including Thai Word/Sentence segmentation, Thai Named Entity Recognition, and Syntactic parser. These technologies are used to analyze relationships within text. The results from this natural language analysis were used to extract associations based on semantic networks, knowledge graphs and semantic-based knowledge representations. The results of the platform can be used as inputs for building an online encyclopedia with page relations and structured summaries in the form of an infobox. Information within such online encyclopedias can be presented as A public database; DBpedia serves as a knowledge base for artificial intelligence (AI) applications such as Q&A and Recommendation systems.

### Preprocessing for Data in Thai

The text processing stage encounters a particular challenge that disrupts the functioning of other systems, namely the identification of Named Entities (NE). NEs can consist of both common words and proper nouns, which may be single or multi-word expressions. However, all NEs need to be treated as single units for practical purposes. Therefore, it is necessary to develop a Named Entity Recognition (NER) system to determine the boundaries of NEs during the preprocessing stage. In Western languages, NEs are often capitalized, making them easier to identify.

**Table 1. Named-Entity count from the cultural text corpus.**

Named-Entity	Total	Named-Entity	Total
DATE_B	1,596	ORGANIZATION_B	589
DATE_I	6,873	ORGANIZATION_I	1,642
LOCATION_B	2,496	PERSON_B	2,207
LOCATION_I	11,013	PERSON_I	8,280
MEASUREMENT_B	1,496	PLACE_B	2,207
MEASUREMENT_I	5,236	PLACE_I	6,287
NUMBER_B	947	TIME_B	32
NUMBER_I	1,888	TIME_I	92
O	188,832	<b>Total</b>	<b>255,197</b>
OBJECT_B	5,001		
OBJECT_I	8,437		

However, in the Thai language, NEs lack capitalization and word spacing, making it challenging to define their boundaries. Contextual cues become crucial in determining the boundaries of Thai NEs, leading to the adoption of deep learning techniques for training models that can recognize NEs. Nevertheless, when the context changes, such as in cultural documents, it becomes necessary to train and create new models. To address this, an experiment was conducted to develop an automatic Named Entity Recognition system from a corpus of cultural texts consisting of 1,272 documents containing a total of 255,197 words as shown in Table 1.

**Table 2. Comparative Results of the Accuracy of Longan model**

Named-Entity	F1-Score	Named-Entity	F1-Score
DATE_B	0.876	ORGANIZATION_B	0.455
DATE_I	0.931	ORGANIZATION_I	0.534
LOCATION_B	0.740	PERSON_B	0.846
LOCATION_I	0.899	PERSON_I	0.876
MEASUREMENT_B	0.903	PLACE_B	0.807
MEASUREMENT_I	0.930	PLACE_I	0.799
NUMBER_B	0.769	TIME_B	0.267
NUMBER_I	0.825	TIME_I	0.511
O	0.965	<b>Micro avg.</b>	<b>0.927</b>
OBJECT_B	0.535		
OBJECT_I	0.546		

Linguistic experts annotated the data with nine types of NEs, including dates, locations, units of measurement, quantities, objects, organizations, individuals, places, and times. The experiment utilized bidirectional gated recurrent units, achieving a micro average F1 score accuracy of 92.7% as explained in Table 2.

## DISCUSSION

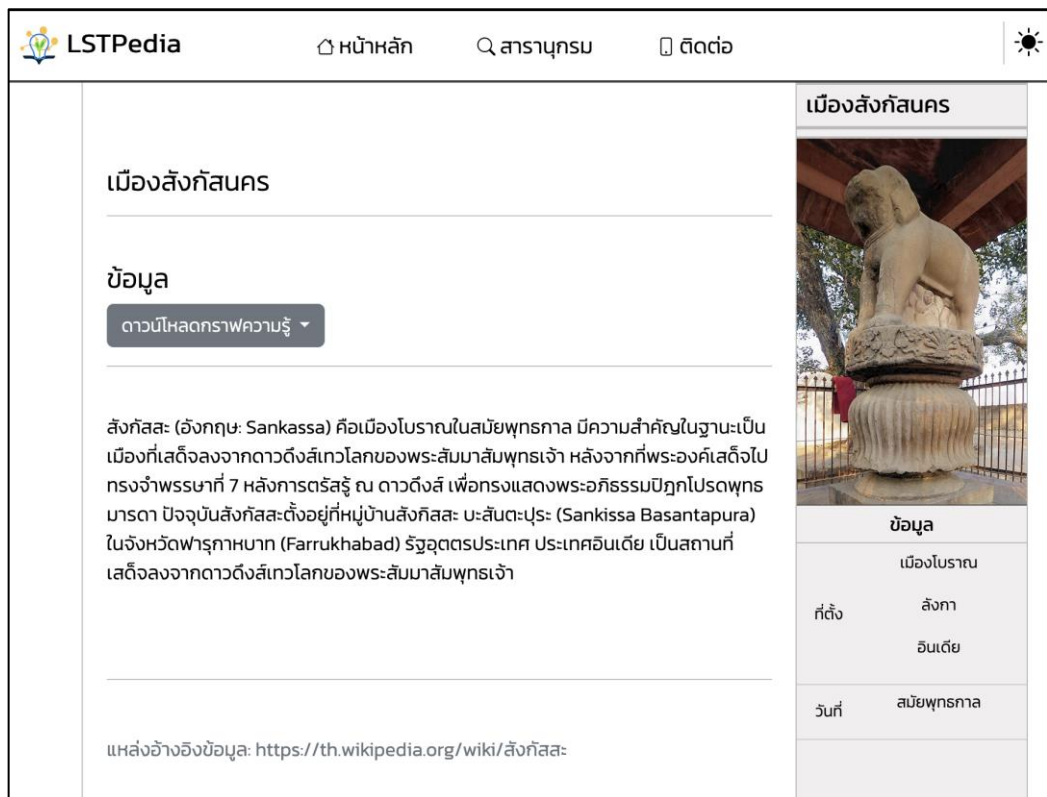
### InfoBox and Generated Knowledge Graph

The InfoBox is a structured information box designed to present crucial details about a particular entity. As aforementioned in the “*Information Extraction in Thai*” sub-section, Extracting the Infobox from unstructured text involves utilizing the pre-trained NLP model called "Longan." The model employs various techniques such as identifying *parts of speech (POS)* and *named entities (NE)* within the unstructured text. Additionally, it identifies the relationships between these entities by locating verbs that serve as potential relations preceding the NE, e.g., “*ตั้งอยู่ที่* (located in)” to generate the knowledge graph, the methodologies previously mentioned in the context of the “*Knowledge Graph Generator*” sub-section were employed. By generating triples based on this information, a knowledge graph for the encyclopedia can be constructed. The results are presented as *Linked Open Data (LOD)*, as illustrated in Figure 5.



**Fig. 5. Exempt of the generated knowledge graph: (a) Extracted InfoBox in the LSTPedia and (b) Knowledge Graph in XML/RDF Format**

To demonstrate the generalizability of our approach, the Longan model exhibits the capability to parse the other domains in Thai. The parsed results are stored as knowledge graphs within the LSTPedia. For instance, the model was employed to parse contextual information from a page pertaining to the "Sankassa City" within the "Pathamasambodhi" domain.



**Fig. 6. The "Sankassa City" within the "Pathamasambodhi" domain in LSTPedia.org<sup>13</sup>**

<sup>13</sup> Language and Semantic Technology Encyclopedia (LSTPedia) <https://lstpedia.org/about/wiki/detail/200>

## Limitation

As evident in Table 2, specific Named-Entity Types, such as "TIME" exhibit lower accuracy. While our work enables the extraction of information and the generation of the KG, certain triples may require revision by relevant stakeholders, such as domain experts, knowledge engineers, and Thai linguists.

## CONCLUSION

This paper presents an approach for digitizing unstructured data into an encyclopedia by leveraging the power of the pre-trained NLP model known as Longan, in conjunction with the Knowledge Graph Generator methodology (Rossanez et al., 2020). The utilization of Longan has been effective in extracting relevant information from unstructured textual data. By applying linguistic analysis techniques, such as word segmentation, part-of-speech tagging, and entity recognition (Theeramunkong et al., 2010), Longan enables the conversion of unstructured data into structured and semantically enriched knowledge representations.

The successful application of this approach has been demonstrated through the Suvarnabhumi case study, which serves as an example of the capability of Longan in extracting important information from unstructured text data. This research significantly contributes to the development of the Digital Transformation Pipeline for Thai Encyclopedia, facilitating the creation of a valuable and accessible digital resource. The findings of this study underscore the potential of combining pre-trained NLP models with knowledge graph methodologies to unlock the vast potential of unstructured data and enhance knowledge management processes.

## ACKNOWLEDGEMENT

This paper is partially supported by linked open data, Thai Wikidata are kindly provided by LSTPedia.org, Language and Semantic Technology Laboratory (LST), National Electronics and Computer Technology Center (NECTEC) that provided insight, necessary resources, and expertise that greatly assisted the research.

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# **An Analysis of Knowledge Structure in the Organic Farming Business: A Synthesis Framework**

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## **ABSTRACT**

This article aims to present an analysis of the knowledge structure within the organic farming business. Through the application of academic principles, including analysis of relevant research studies, research methods, and a synthesis framework for knowledge structures, the content and grouping of knowledge are examined. The findings indicate that the knowledge of organic farming business can be categorized into three main groups: 1) organic farming system, 2) business management system, and 3) organic agriculture standards. These results can serve as a valuable reference for developing a knowledge management system specific to the organic farming industry. By providing a structured and systematic approach to analyze knowledge relationships and address the knowledge needs of organic farming entrepreneurs, it paves the way for a more efficient and thriving organic farming industry. As a referral system, this framework contributes to the continuous growth and development of the organic agriculture business sector.

**Keywords:** Knowledge organization system, Knowledge synthesis, Organic farming business

## **INTRODUCTION**

Agriculture is among the economic activities that contribute to atmospheric, soil, and water pollution due to the use of agricultural chemicals. In response, organic farming has emerged as a sustainable farming practice. This agricultural production system is based on natural processes and resources, refraining from the use of chemical substances or genetically modified organisms (GMOs) to promote a healthy and nutritious diet. Simultaneously, there is a growing demand for food and organic products. When striving to meet the increasing demand for agricultural products, it is crucial to consider methods that do not compromise the economy or the environment. This can be achieved through the promotion of innovative approaches and appropriate technologies in production and processing. Furthermore, obtaining organic certification for agricultural products intended for commercial use, along with effective marketing strategies, plays a significant role. Farmers aspiring to transition into entrepreneurial roles must acquire knowledge in marketing, as well as in production and processing management, to transform their agricultural practices into successful business ventures. In the agricultural industry or agricultural business sector of Thailand, there are five key steps involved: 1) Agricultural Biotechnology 2) Implementation of Novel Farming Systems 3) Farm Management and Control Systems 4) Innovations in Post-harvesting Processes and Logistics 5) Provision of Agricultural Services. It is evident that operating an organic farming business is a complex endeavor that demands a profound level of expertise. However, the exchange of knowledge among farmers in this field remains limited. For instance, farmers often struggle to generate an adequate supply of raw materials suitable for commercial purposes. Additionally, they may encounter challenges such as non-standardized

production processes, insufficient knowledge in management accounting, and a scarcity of funds and access to capital sources. In order to progress towards commercialization, it is imperative to overcome these limitations and make necessary adjustments in the development process. This includes modifying production patterns from upstream to downstream to enhance efficiency and profitability.

Knowledge is a product of human cognition. However, organizing the structure of knowledge requires a conceptual approach and the application of a knowledge management system based on integrated concepts. This approach allows for the identification of related and interconnected elements by conceptualizing group concepts and establishing relationships between them. The outcome is a knowledge agent that serves as an indexing tool for content management and retrieval. Through analysis and synthesis of knowledge, combined with the utilization of tools, a systematic knowledge repository is created, enabling future access and utilization.

## **LITERATURE REVIEW**

### **Organic Farming**

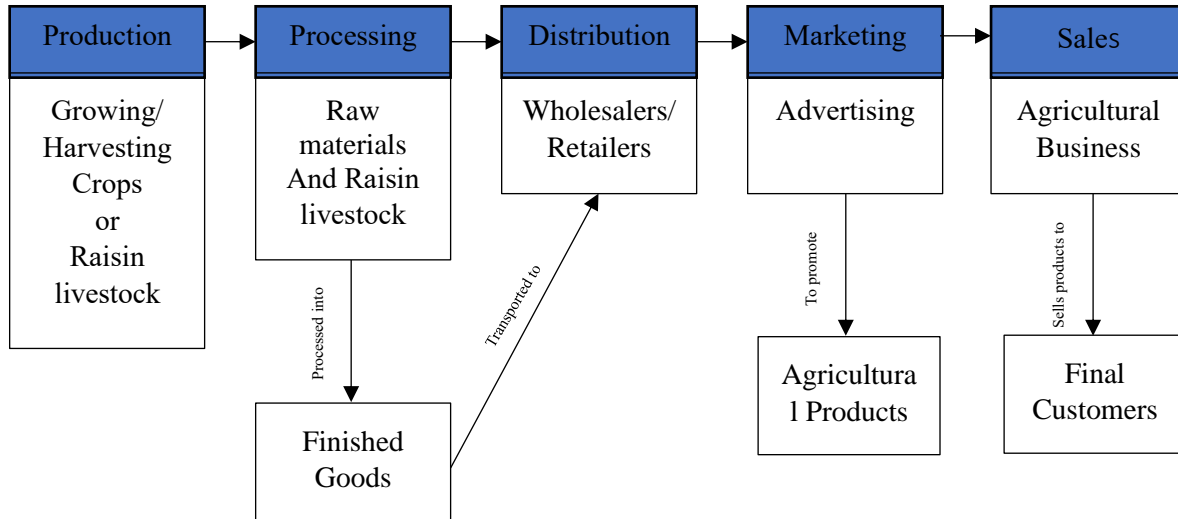
Organic farming is a sustainable agricultural management system that prioritizes the preservation of natural balance and biodiversity. It achieves this by avoiding the use of chemicals in soil, water, and air, as well as refraining from utilizing genetically modified plants, animals, or microorganisms. If external production inputs are employed to enhance productivity and disease resistance, they must adhere to organic farming principles. The overarching objectives of organic farming encompass environmental, social, and economic sustainability, alongside the production of high-quality and safe organic agricultural products for both producers and consumers. To attain organic farming standards at the community, national, and international levels, several essential operations must be executed: 1) Implementation of standards and certification systems for organic agriculture 2) Promotion and support of organic farming through the establishment of interconnected networks encompassing production, processing, and marketing 3) Provision of necessary infrastructure and production factors to facilitate organic farming practices 4) Systematic research and development efforts aimed at enhancing knowledge and innovation in organic farming. Concrete implementation of these strategies can be achieved by developing a comprehensive central database encompassing the entire organic agricultural supply chain. This database would facilitate marketing efforts through both online and offline systems, catering to local communities, national markets, and international trade. Additionally, enhancing the efficiency of logistics systems is essential.

### **Agricultural business**

Entrepreneurship plays a vital role in identifying market opportunities and generating value. In developing entrepreneurs through a comprehensive learning process is crucial about skills, and experiences in various facets of the agriculture industry, particularly essential business management skills. Effective planning of management strategies, utilizing marketing systems to guide production, and implementing successful sales techniques, including digital marketing, are key components. Furthermore, incorporating modern agricultural management innovations in diverse forms is pivotal for optimizing productivity and efficiency in the agricultural sector. The steps depicting how agribusinesses work consists of 5 steps as follow: Step 1 production is involving activities such as planting, cultivating, harvesting crops, and raising livestock. Farmers engaged in these processes are responsible for the production of raw materials. Step 2 processing involves transforming raw materials, including livestock, into finished goods such as canned food or meat products, which also includes packaging. Step 3 Distribution is distributing finished goods to wholesalers or retailers for sale. Step 4 marketing is



advertising to promote agricultural products and build brand awareness. Step 5 Sales is businesses generate revenue by selling their products to consumers or other companies. They may engage in contract negotiations, determine prices, manage the supply chain, and provide customer service. (Thakur, 2023) Showing in Figure 1.



**Fig. 1** Agricultural businesses work step

### Knowledge organization system

Organizing knowledge entails the establishment of a structured system, which is regarded as a crucial tool for systematically recording and transferring human knowledge. This system enables individuals to collect, store, search, and effectively utilize existing knowledge. Additionally, it provides a foundation for connecting and expanding upon existing knowledge, ultimately facilitating the creation of new knowledge (Taylor, 2004). Knowledge organization systems are designed to serve various purposes and are structured frameworks that aid in organizing knowledge effectively. Categorical structures, in particular, offer a clearer understanding of knowledge groups and their relationships. The specific type of cognitive structure employed depends on the characteristics of the phenomena and the elements used as the foundation for organizing the knowledge. Classified into 3 types as shown in Table 1 (Hodge, 2000; Si, Xu, & Chen, 2006).

**Table 1. Type of Knowledge organization system**

Type	Description	Example
Term List	The knowledge management system presents a compilation of terms along with their corresponding meanings, without explicitly indicating any associations or relationships.	<ul style="list-style-type: none"> <li>• Glossary</li> <li>• Authority File</li> <li>• Dictionary</li> <li>• Gazetteers</li> </ul>
Classification and Categorization	A knowledge management system encompasses a comprehensive compilation of content organized through a hierarchical structure of terms or concepts. Within this system, relationships between terms or concepts are defined, thereby demonstrating sophisticated semantic connections.	<ul style="list-style-type: none"> <li>• Subject Heading</li> <li>• Classification Scheme</li> <li>• Categorization</li> <li>• Taxonomy</li> </ul>

Relationship Group	Knowledge management systems showcase vocabulary lists that elucidate the relationships between terms and their corresponding concepts. Additionally, these systems offer a hierarchical perspective, emphasizing broader concepts and illustrating their semantic relationships. These semantic relationships are described alongside the list of terms and concepts.	<ul style="list-style-type: none"> <li>• Sematic Network</li> <li>• Thesauri</li> <li>• Ontology</li> </ul>
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## APPROACH AND METHOD

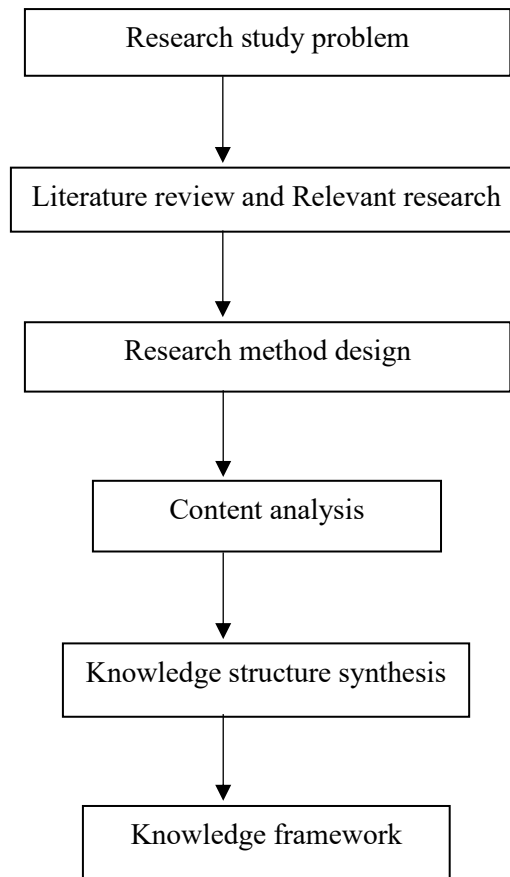
This study represents a synthesis of knowledge frameworks, specifically focusing on the synthesis of knowledge pertaining to the organic farming business. Employing a qualitative approach, this study utilized the content analysis method to extract and analyze information resources. To accomplish this objective, the following actions were undertaken:

2.1 Document analysis was conducted on academic sources, including books, articles, and relevant research papers, available in both printed and electronic formats. These documents encompassed both Thai and foreign languages and covered the time period from 1973 to 2022. The collection of documents was sourced from reputable databases such as Thailis and Scopus. The search terms employed were organic agricultural, organic farming, organic business, and organic farming entrepreneurs. After the initial search, a total of 93,307 documents were found. Subsequently, documents related to Business Management and Accounting, Economics Econometrics, and Finance were selected, while those lacking author's name and year were excluded. The selection was further refined to include only English articles and books, resulting in a final count of 1491 documents. The meticulous selection process ensured that the chosen documents served as valuable resources for delineating the scope and structure of knowledge within the organic agriculture business.

2.2 Content analysis is employed to define and analyze concepts, utilizing a knowledge content analysis form. The analysis involves categorizing the main content groups. By considering the title, title, abstract, content in order to extract the concept and term. (Gnoli, 2008; Hjorland, 2008).

2.3 Knowledge classification involves grouping the analyzed contents by categorizing similar concepts or terms into the same category. Furthermore, groups with distinct content are formed to create new categories, while delineating the scope of each category. The classification process also considers the hierarchical relationships among the content, resulting in the creation of a hierarchical structure. (Taylor, 2004)

2.4 Constructing a knowledge framework In this phase, a knowledge framework is developed to represent the synthesized knowledge. The framework serves as a visual representation that illustrates the relationships and organization of the various knowledge components within the domain of organic farming business. This representation facilitates a clear understanding of the interconnections between different concepts and enables effective knowledge management and utilization in the field. (Kumar, 1985)



**Fig. 2.** Educational framework

## RESULT

### 1. Results of document analysis

Through the analysis of knowledge content from 1491 documents in Business Management and Accounting 807 documents, Economics Econometrics and Finance 684 documents. The knowledge can be categorized into three major groups. These groups encompass the content related to agricultural processes, agribusiness processes, and the content pertaining to organic agriculture standards. However, it is important to note that there is currently no specific standard for classifying knowledge within the domain of organic farming business. As a result, the important content is scattered throughout various sources. Therefore, it is imperative to conduct further research to reorganize and group the content systematically. As depicted in Table 2.

**Table 2. Results of document analysis**

<b>Content</b>	<b>Description</b>
Organic agricultural process	The focus of the study is on the organic farming system, encompassing plants, animals, and aquatic organisms. It encompasses various aspects, starting from the production system and extending to product management, integrated water management, and soil management.
Organic Agricultural business process	The focus of the study is on the marketing chain from upstream to downstream, encompassing various stages. It begins with production value-added activities and extends to trading, processing and packaging, export, and retail sales.

Organic agriculture standards	The focus of the study is on the organic standards, which encompass both domestic and international guidelines. These standards serve as requirements that encompass the entire organic farming process, from upstream to downstream activities.
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## 2. Results of content analysis

The analysis of the document contents revealed that knowledge regarding organic farming and agribusiness shared similar content, including the agricultural process, agribusiness process, and organic agriculture standards. These contents were further analyzed and categorized into six distinct groups: 1) production 2) processing 3) marketing 4) transportation 5) accounting 6) standards and certification systems for organic agriculture. Each group consists of detailed concepts and terms that aid in providing a clearer grouping of the content, as depicted in Table 3.

**Table 3. Results of content analysis**

Knowledge Group	Scope
Organic agricultural process	Knowledge about production consists of 4 sub-class: 1) Crop production 2) Animal husbandry 3) Aquaculture 4) Product management and 16 divisions, namely 1) Land management 2) Soil management 3) Management Watering 4) Planting 5) Post-harvest management 6) Weed and pest control 7) Harvesting 8) Breeding 9) Animal care 10) Feed 11) Breeding 12) Animal treatment 13) Feeding Animal transport 14) Aquaculture 15) Product storage 16) Product quality
Organic Agricultural business process	Business management knowledge consists of 6 sub-class: 1) Procurement of factors of production 2) Production 3) Value addition 4) Processing and packaging 5) Trading 6) Financial management and 11 divisions, namely 1) Raw Material Import 2) Branding 3) Product Design 4) Processing 5) Packaging 6) Marketing Channel 7) Export 8) Logistics 9) Accounting 10) Investment 11) Safety Management risk
Organic agriculture standards	Knowledge about organic agriculture standards consists of 2 sub-class: 1) Standard requirements 2) Standard certification and 7 divisions, namely 1) Production source certification 2) Processing certification 3) Distribution certification 4) Import certification 5) Labelling 6) Certification body 7) Certification process

## 3. Results of knowledge classification

In this phase, the findings of the knowledge analysis are utilized to synthesize the scope and structure of the knowledge. The library classification approach is applied to group similar content together. The study reveals that the knowledge can be classified into three distinct categories: 1) Organic agricultural process 2) Agribusiness process and 3) Organic agriculture standards. As depicted in Table.

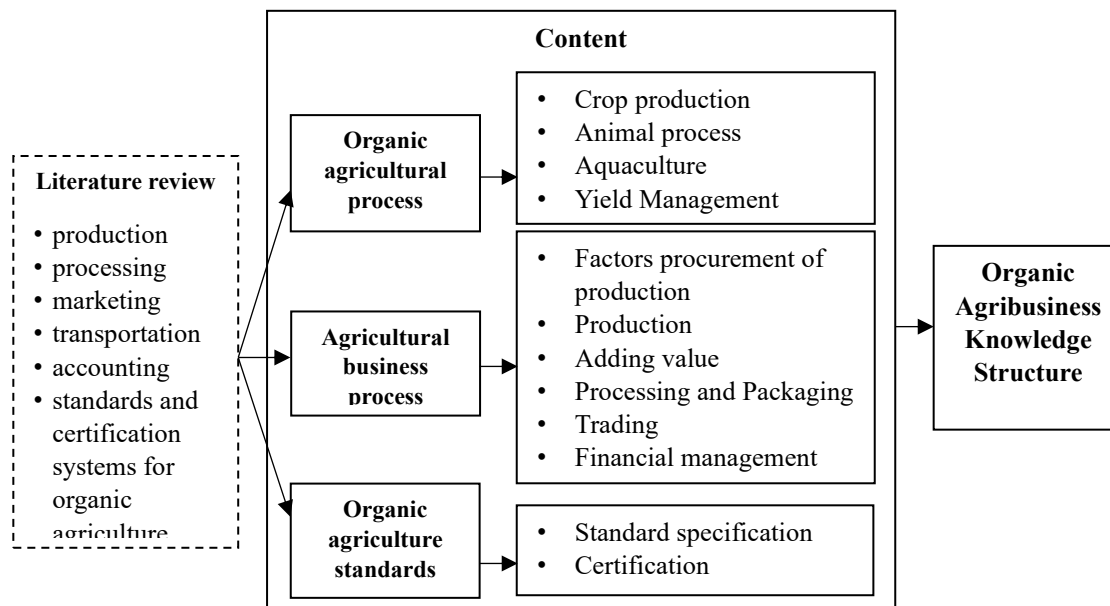
**Table 4. Results of knowledge classification**

<b>Class</b>	<b>Sub-class</b>	<b>Division</b>	<b>Scope of division</b>	
1. Organic agricultural process	1.1 crop production	1.1.1 land management	knowledge about organic agriculture standards for planting land preparation	
		1.1.2 soil management	knowledge about organic agriculture standards in soil preparation, soil nourishment	
		1.1.3 water management	knowledge about organic agriculture standards for water use wastewater treatment	
		1.1.4 planting	knowledge about organic agriculture standards in planting methods, fertilizing	
		1.1.5 harvest	knowledge about organic farming standards for harvesting	
		1.1.6 weed and pest control	knowledge about organic agriculture standards in how to eliminate weeds and pests	
		1.1.7 harvesting	knowledge about organic agriculture standards for harvesting methods	
		1.1.8 propagation	knowledge about organic agriculture standards in plant propagation methods planting seeds	
	1.2 animal process	1.2.1 animal care management	knowledge about organic agriculture standards in animal care, methods cleaning, animals house cleaning	
		1.2.2 animal feed	knowledge about organic agriculture standards in the category of animal feed	
		1.2.3 animal breeding	knowledge about organic agriculture standards in animal breeding methods	
		1.2.4 animal treatment	knowledge about organic agriculture standards for veterinary medicines	
		1.2.5 animal transportation	knowledge about organic agriculture standards in animal movement methods	
	1.3 Aquaculture	1.3.1 aquaculture	knowledge about organic agriculture standards in aquatic animal propagation methods	
	1.4 Yield Management	1.4.1 Product storage	knowledge about organic agriculture standards in aquatic animal propagation methods	
		1.4.2 Product quality	knowledge about organic agriculture standards in aquatic animal propagation methods	
	2.	2.1 factors procurement of production	2.1.1 importing raw materials	knowledge about organic agriculture standards in finding organic raw materials.

<b>Class</b>	<b>Sub-class</b>	<b>Division</b>	<b>Scope of division</b>
Agricultural business process	2.2 production	2.2.1 branding	knowledge about marketing methods branding Product design
	2.3 adding value	2.3.1 product design	knowledge about product design knowledge content
	2.4 Processing and Packaging	2.4.1 Processing	knowledge about processing methods and standards for organic farming in processing
		2.4.2 Packaging	Knowledge about organic agriculture standards in the procurement of packaging
	2.5 trading	2.5.1 marketing funnel	knowledge content about trading sources
		2.5.2 Export	knowledge about organic agriculture standards in product delivery, requirements and methods
		2.5.3 portage	knowledge about organic agriculture standards in the transportation of goods
	2.6 financial management	2.6.1 accounting	knowledge about cost, profit, income and expense recording
		2.6.2 investment	knowledge about finance company, profit, tax
		2.6.3 risk management	knowledge about loss prevention
3. Organic agriculture standards	3.1 standard specification	3.1.1 source production certification	knowledge about organic standards for production source
		3.1.2 processing certification	knowledge about organic standards for processing
		3.1.3 distribution certification	knowledge about organic standards distribution
		3.1.4 Product import certification	knowledge about organic standards for imported products.
		3.1.5 labelling	knowledge about organic standards for labelling
	3.2 Certification	3.2.1 certification agency	knowledge about Organizations related to organic certification
		3.2.2 Certification process	knowledge about Steps of applying for organic certification

#### **4. Structural knowledge synthesis framework**

In study, it is crucial to analyze the knowledge relevant to the subject within the defined study objectives. Consequently, there arises a need to systematically investigate and categorize the scope and structure of knowledge. This process plays a vital role in offering a comprehensive overview of the study and serves as a guiding framework for the further development of the knowledge management system. The synthesis of the knowledge structure of the organic farming business is illustrated in Figure 3, showcasing the knowledge structure framework.



**Fig. 3. Framework of Organic Agribusiness Knowledge Structure**

## CONCLUSION

The success of an organic farming business relies on its seamless integration within the supply chain that links production and consumption. Entrepreneurs involved in organic farming must possess comprehensive knowledge that encompasses both organic farming practices and agribusiness principles. This multifaceted understanding allows them to optimize their operations, ensure the delivery of high-quality organic products, and meet the demands of an increasingly conscious consumer market. By fostering expertise in both organic farming and agribusiness, entrepreneurs can effectively contribute to the sustainable growth and development of the organic farming industry.

The proposed framework offers a comprehensive approach to examining the characteristics of knowledge relationships in the organic agriculture business. By employing this framework, researchers and practitioners can gain insights into the interconnectedness and interdependencies of knowledge within the organic farming industry. Moreover, the framework facilitates a thorough investigation of the knowledge requirements of organic farming entrepreneurs. Understanding these needs is essential for the development of a knowledge-based system tailored to support organic farming businesses effectively. According to related research studies, it was found that the information requirements of farmers and organic entrepreneurs are the same: Marketing, Cost/expenses, Profitability, Production inputs and, techniques, Organic certification guidelines. (Marsh, Zoumenou, Cotton, & Hashem, 2017). As well as the study of Elzakker & Eyhorn (2015) has written 9 categories of requirements for organic farming business, namely 1) personnel should have knowledge about accounting management, marketing, labor for processing, packing and transport 2) Building should have knowledge about processing facilities, storage facilities 3) processing equipment should have knowledge about cleaning, sorting, grading equipment, machinery 4) Transport equipment should have knowledge about trucks for transport of goods 5) IT and Communication equipment should have knowledge about internet, printer 6) other technical equipment should have knowledge about scales to weigh goods, GPS 7) External service should have knowledge about business advisory service, auditing service, financial service 8) Certificate should have knowledge about organic certificate, export permits and 9) Finance should have knowledge about own capital, credits, trade loans. According to related research studies, it was found

that the information requirements of farmers and organic entrepreneurs are the same: Marketing, Cost/expenses, Profitability, Production inputs and, techniques, Organic certification guidelines. This is in line with the knowledge structure synthesis framework designed to cover the entire organic agricultural process, agricultural business process and Organic agriculture standards. This framework serves as a valuable reference and guide for organic farmers, enabling them to make informed decisions and enhance their agricultural practices. By incorporating this knowledge-based system, organic farming entrepreneurs can harness the power of information to improve productivity, sustainability, and overall performance in their businesses.

In conclusion, the proposed framework for advancing the field of organic agriculture. By providing a structured and systematic approach to analyze knowledge and address the knowledge needs of organic farming entrepreneurs. This framework contributes to the continuous growth and development of the organic agriculture business sector. The study of Wynen & Vanzetti (2000) assessed the future direction of organic farming research. There are a number of issues of interest besides crop and livestock production including: stockless systems, machinery, labor, economics, marketing issue, policy development, audit systems, energy, strengthening self-regulatory, and data availability. Therefore, knowledge organization will help spread information. and there is no clear category There is a framework for synthesizing relevant knowledge. and bring a framework to develop and expand the scope of knowledge to meet the demand for information and ready to use information comprehensively in the knowledge of organic farming.

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## **SECTION III**

### **INFORMATION AND LIBRARY SCIENCE PRACTICES**

# **Implementation of the Seven P's of Marketing in Library Services – Enriching Management Students**

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## **ABSTRACT**

Learning Resource Centre provide real value in terms of resources to its users'. Utilization and promotion of the library resources is an important part of the Library Service. This research highlights the add-on services undertaken by the Learning Resource Centre to promote their resources to the user and develop innovate strategies to utilize library services.

GNIMS Learning Resource Centre have employed many innovative library services to satisfy the new generation of users'. The study explores the different marketing services 7 P's Price, Place, Promotion, Product, People, Process and Physical Evidence adopted by GNIMS Learning Resource Centre to allot enhanced and upgraded facilities and simplified the process of getting access to digital resources. Users' requirements were assessed by the Library Manager and new innovative marketing concepts were evolved to increase the Library users'. Marketing Guru, Phillip Kotler quotes "organizations such as Museums, Universities, Libraries, and Charities need to market their causes. Libraries and Information Centers have begun to realize that marketing of information products and services is an integral part of administration, especially as a means for improving user satisfaction and promoting the use of services by current and potential users".

**Keywords:** Add-On Services, Library Services and Products, Users Satisfaction, Professional Skills

## **INTRODUCTION**

It is essential that users make the best use of resources and services offered by the Learning Resource Centre. Promotion is the ongoing process of creating a connection between the Learning Resource Centre and its Users'. Research is a key element of Marketing. Librarians must take into consideration the Users' requirements. Then, the Learning Resource Centre establishes its value in meeting the Users' need and expectation to continue the cycle.

In today's Digital Scenario all the library professionals must be ICT savvy. They and their staff must be updated on the current technology in their field. The term 24 x 7 access to libraries for maximum and effective use of the e-resources is relevant in today's scenario. Libraries- nonprofit Institutes, are always providing services physically as well as online. Customizing libraries with personalized services and maintaining users' insights is a necessity now-a-days.

## **LITERATURE REVIEW**

Awareness of earlier investigation in our research refers to Literature Review.

- Library Extension Services in SKUAST-K Library System: A Case Survey by Asifa Jan, (2022) states that maximum utilization of the resources available in the library will be done by providing digital services to its users.
- Borgohain, Debajit and Nath, Rima, in their article “Public Library Extension Service as a Community Development Programme: A Case Study” (2020), discusses the problems and probable solutions for providing extension services in public libraries, to motivate students to read.
- Monai Mitra from The University of Burdwan, in her article Promoting Library Services in the Digital Era among the Children and Young Adults, mentions that new era users want technology-based solution to everything, fast information at their fingertips.
- Joshua, Dauda and Michael, Daksiri, "Effective marketing techniques for promoting library services and resources in Academic libraries" (2020), states that the resources and services provided by the Learning Resource Centre range from knowledge access through print and electronic medium, and research support to printing services and the provision of information skills, supported by one on one assistance and advice.
- M. Madhusudan (2008) has mentioned in his paper “Marketing of Library and Information Services and Products in University Libraries: A Case Study of Goa University Library”, identifies these factors. Financial restrictions, online resources, networking, discussion Groups are the many challenges faced by the Libraries. Library Professionals must adopt branding their services on various online and social media platforms.
- Chandratre Shripad V and Chandratre Meghana S. (2015), in their research paper “Marketing of Library and Information Services” discusses the challenges of branding of the services provided by the Libraries as well as the daily routine duties.
- Kotler (1999) explains, that marketing is the process of preparation and applying the conception, pricing, promotion and circulation of goods, services and ideas to create exchanges with target groups that satisfy customers and organizational objectives. Under the umbrella term marketing, we study concepts like building customer relationships, branding and corporate identity, marketing communications, price and pricing policy, collecting marketing data and marketing strategy and planning. As the author rightly identified the different strategies to adapt and influence the users, in the same manner, libraries should come up with the innovative mode of services.
- Hongbo Zou, Hsuanwei Michelle Chen and Sharmistha Dey (2015) has cited in their paper “A Quantitative Analysis of Pinterest: Understanding Library User Engagement Strategies for Effective Social Media Use” that all the organizations and institutes are using the social media platforms to accomplish their set goals.

## **RESEARCH METHODOLOGY**

Empirical Research was undertaken, and survey method was used for this research. The population comprised specifically of the Students of GNIMS, from different streams. The research is conducted to examine the objectives of Learning Resource Centre and to meet the Institutional Goals. The study included the students of the various courses conducted in the Institute. Responses were collected from Full-Time (MMS/PGDM) and EMBA (Working Professionals) (Batch 2019-2021). The data collected was subjected to analysis through tables and graphs. The reliability was determined through data analysis.

### **Objective:**

Main objective was to examine the following:

- Users' comfort with Learning Resource Centre Infrastructure / Ambience.
- Users' awareness about the add on services provided.

- Interaction between the Library Staff and its Users’.

**Research Problem Statement:**

This research was conducted to determine how the Learning Resource Centre can reach out to each Individual User to utilize the library resources and services. Libraries should use different strategies to market and brand their services to attract their users and to upsurge the best benefit of the resources.

**Scope of the Study:**

- The Study covers only SGPC’s Guru Nanak Institute of Management Studies and SGPC’s GNIMS Business School Learning Resource Centre Users’, Mumbai.
- To create new Readers by converting non-readers to readers.

**ADD-ON SERVICES:**

The seven P’s of Marketing were adopted by the GNIMS Learning Resource Centre for providing add-on services to its users’.



**Fig. 1. GNIMS Library 7 P’s**

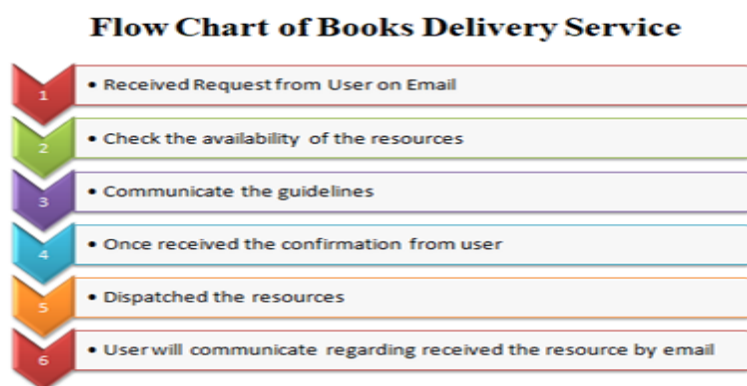
The below table gives the seven P’s of Marketing implemented by GNIMS Learning Resource Centre.

**Table 1. Describes 7 p's**

<b>(1) Place</b>	<b>(2) Promotion/ Marketing</b>	<b>(3) Product</b>	<b>(4) Price</b>	<b>(5) People</b>	<b>(6) Process</b>	<b>(7) Physical Evidence</b>
Infrastructure  Ambience	Compliance Activities conducted Facilities available Monthly Top 10 Users and Top 10 Books available. Best Library User Award	Value Add Books, Journals, Students Project, Annual Report. E- Resources	Time	Well Trained and experienced Team  Locate the books or use the e- resources /Online Database. Library Orientation	Library adopt, adapt new process and follow the procedure of different accreditation bodies - ISO / NBA	Resources, Infrastructure Ambience Comfortable Chairs and Tables, Good ambience Lighting, Centrally Air- conditioned, CCTV.
Learning Resource Centre Layout / Course Wise Self Display List of Books.	Utilization of Resources with different parameters.	Personal Assistance  Issuing Digital Library Cards	Effort	Professional and Efficient Staff	Location of Resources	Daily work Performance of the Staff.
Expanding the Service Area	Course wise Promotion of Learning Resource Centre Services	Reference Service  Issuing Resources to the users'	Search Engine – WEB - OPAC	Team Encourages and Motivates the Users'	Attendance Mechanism - Biometric	Feedback- Library Services and Events/ Value add activities conducted.
Learning Resource Centre Website	Customer Relations	Online Database	Time Cost		Integrated Work Administrative Software – SLIM21	Communication / Notices by Email / Telephone and Social Media Groups.
Mobile App	Awareness Sessions	Inter Library Loan	Efficient and Quick Service		Book Delivery Service.	Data Entry Integrated Administrative Software – SLIM21.
Resources Available	Display Books subject wise /	On demand delivery of resources.	Efficient use of the users' time			

	Colored Book Display to attract users’.					
Learning Resource Centre open 10 x 7	NDLI Book Club	Assistance to Access Online Database	Stress free Service			
Different Channels to reach Users – TRF (Telephone Renewal Facility) / Email / SMS / Class Representative’s WhatsApp Group.			Off Campus Service			
Book Delivery / Courier Service	Issuing resources through various channels	Digital Learning Resource Centre Card	Concession in case of Medical Emergency/ waive off the fine to recover resources.	Enhance users’ knowledge by training the staff in Digital Skills.	Transforming Information and Knowledge from print to digital.	Upgrade Website for more visibility of Library Resources and add-on services

**Place** – Book Delivery Service on demand / Courier Service was another add-on service offered by the Learning Resource Centre during the Pandemic. This was a paid service and very popular amongst the faculty and students.



**Fig. 2. GNIMS Book Delivery Service Process Flow**

SGPC’s GNIMS Business School and Guru Nanak Institute of Management Studies is in the heart of the Mumbai City.



Learning Resource Centre provides an ambience suitable to conduct research by the users'. All the modern latest technological products are adopted, adapted and installed for the users benefit - Airconditioned Reading Hall, Comfortable Chairs and Tables, Good Ambience Lighting, Biometric Attendance System and CCTV Cameras for Security purpose and WI-FI System.

**Promotion / Marketing** – Keeping in mind the busy schedule of users' as well as corporate Annual Members, Learning Resource Centre has started a new Innovative service for renewal – Users can reissue the library resources through various channels like -

1. In Person.
2. By Email.
3. Renewal Facility on Telephone
4. Courier Service.
5. SLIM 21 Software.



**Fig. 3. Issue, reissue process**

SLIM21 (System for Library Information and Management) software is a highly comprehensive and user-friendly software. It benefits both the Library and their users. The library can catalogue its resources, that contain information vital to the Institute. The mode of education becomes liberal, affordable, universal and easy interface through the library system. Local Users as well as from those from remote location can search, access, retrieve and disseminate educational resources. Even a catchy phrase in the description of the catalogued item can be used for searching.

SLIM 21 Software provides different modules as per the function required by the library. It is dependent from library to library as per their customer demand. As per our user needs, GNIMS Learning Resource Centre has been using various modules for our administrative work like Circulation (Issue, Return, Reissue), with login ID and Password, even our users are able to reissue the books by themselves.

- SLIM Software is very useful for daily routine work.
- Different type of statistical report helps us for the Audit purpose.

The other most useful module is Statistical analysis. This Module produces different statistical information required for library management such as:

Distribution of transactions over working-hours, week-days, or months.

- Popularity of subjects and Item Types.
- Most active or inactive items and members

## **VALUE ADD ACTIVITIES:**

Several Value Add Activities are conducted, and promotion of these activities are done by digital medium / Social Network (Facebook, Instagram, LinkedIn, etc.).

As a promotional activity, every month Top 10 users are recorded, and Best Library users award are given to our best users after the completion of their course.

**Product** – Digital Library Card is an innovative idea started newly. Users' are requested to fill the google form and a digital library card is created for them. This service has saved the time, resources and budget of the Learning Resource Centre and the users.'

Personal Assistance is offered to the User to locate the books or use the e-resources /Online Database.

**Price** – Learning Resource Centre waived off the fine to recover resources during the pandemic and in case of genuine emergency. Students appreciated this service.

Library Timings plays a crucial role in the users' life. Learning Resource Centre Staff is aware of the User's time; hence they try to assist the user immediately and efficiently.

**People** – Acquiring new digital skills is mandatory in today's digital world. GNIMS Learning Resource Centre staff constantly update their digital skills to keep abreast of the time.

Professionalism and upholding good rapport with the users is the motto of the GNIMS Learning Resource Centre Staff. Regular training is provided for its staff so that they are updated with the new innovations and can better serve the users'.

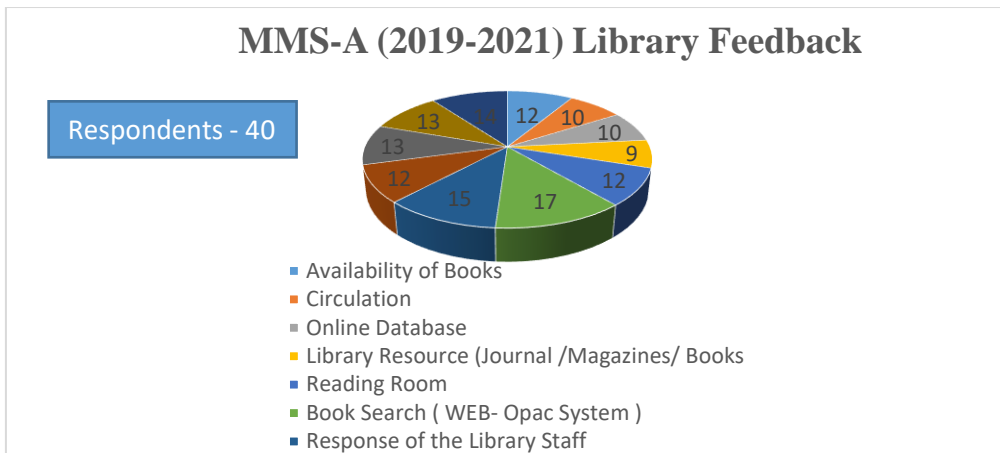
**Process-** Transforming Information and Knowledge from print to digital media for better utilization of resources and providing users with instant data is another innovative service undertaken by the Learning Resource Centre.

GNIMS Learning Resource Centre is well equipped with the latest technology to fulfill /meet the compliance of International Standard Organization (ISO) Certification and National Board of Accreditation (NBA), on a regular basis.

**Physical Evidence** – Upgrading Learning Resource Centre Website for more visibility of Library Resources and add-on services was also undertaken. Communication with the Learning Resource Centre users are very important. Hence all the Learning Resource Centre related notices are communicated to our users' through different channels like Official Notices / Communication, SMS, Emails and WhatsApp Group. Feedback received from users are reflected upon and their suggestions if feasible are implemented as soon as possible. Learning Resource Centre Integrated Administrative Software SLIM21 is our main evidence to connect with the Users.

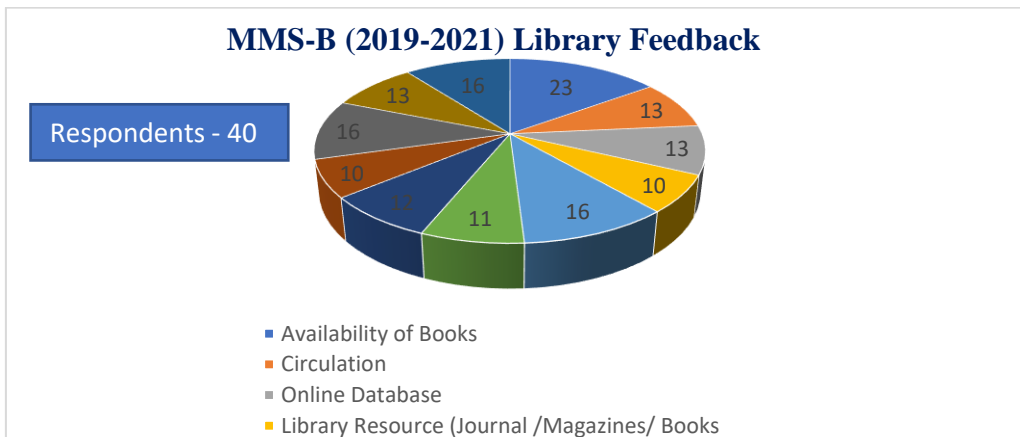
## **CORRELATION:**

GNIMS Learning Resource Centre has correlated seven P's with their Services and Facilities. There is no discrimination between full-time and part-time users. Our motto is to provide best services to all our students. From time to time, Services and facilities are upgraded as per the requirements of the users'.



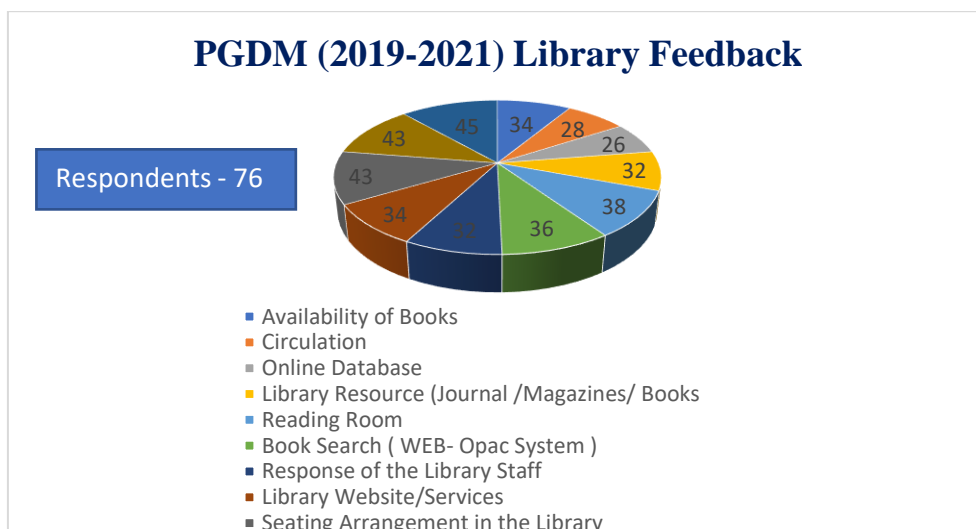
**Fig. 4. Library Feedback from Class MMS Division A**

**Interface:** The above graph indicates that out of 40 respondent’s 17 users utilizes the WEB – OPAC for book Search and 9 users utilized the Library Resources.



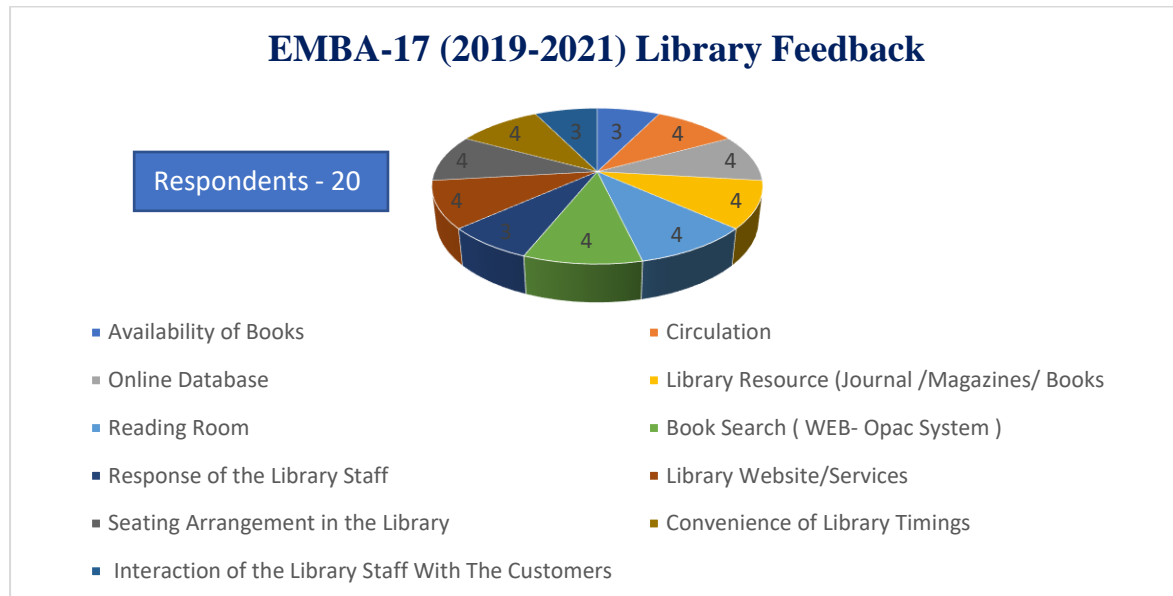
**Fig. 5. Library Feedback from Class MMS Division B**

**Interface:** The above graph indicates that out of 40 respondent’s 23 users are happy with the availability of Library Resources and 10 users utilized the Library Resources and Library Website.



**Fig. 6. Library Feedback from Class PGDM**

**Interface:** The above graph indicates that out of 76 respondent's 45 users are content with the Interaction of the Library Staff and 8 users are pleased with the Response received from the Library Staff.



**Fig. 7. Library Feedback from Class EMBA**

**Interface:** The above graph indicates that out of 20 respondents' 4 users are satisfied with the various resources and services offered by the Learning Resource Centre and 3 users are content with the Response received from the Library Staff.

### COMPARATIVE ANALYSIS:

Our Full-Time (MMS/PGDM) and EMBA (Working Professionals) have different perspective about the Learning Resource Centre Services and Facilities. Full-Time users are utilizing the Learning Resource Centre through the week, whereas EMBA users utilizes the Learning Resource Centre only on the weekends. Hence, both have different outlook of the Learning Resource Centre.

### FINDINGS

The result of the study shows the following:

- Promotion of Information Resources have increased the Users' in the Learning Resource Centre.
- Optimum use of Library Resources is observed.
- Non-readers are converted into readers and new members are initiated into the art of reading.
- It has been observed that all library facilities are highly and intermediately correlated with each other.
- Efficiency of Learning Resource Centre Staff have increased due to upskilling and reskilling through training and motivation.
- Reading of the Users' has increased due to the Value Add Activity.

### CONCLUSION

Information services are provided in anticipation of various needs of the users' of the libraries. Librarians must keep themselves updated on the technological advancement in the field. Design thinking of innovative ideas, visualization of the future needs of the Users, and out of the box thinking

of the Learning Resource Centre Team are the key to influence the users to continue using the Learning Resource Centre resources and become Members of the Learning Resource Centre. Feedback received from the Users is constantly reviewed and implemented.

New innovations and knowledge of the latest technological advancement will assist in branding the library services for the users and enhance the reputation of the Library professionals. As knowledge demand increases in libraries, it becomes more complex, and there is a strong obligation to implement new marketing strategies to make the library valuable.

Effective marketing requires careful planning, creative approaches, and focused strategies. Librarians must think beyond traditional methods and employ nontraditional methods to attract new users' and nurture existing users'.

GNIMS Learning Resource Centre have always tried fulfilling users' requirements as and when they need any information from the library staff. During lockdown a unique innovative service - Book Delivery Service was initiated. Here, the Learning Resource Centre created a separate Email ID, wherein the users can request for Library resources and the Learning Resource Centre staff couriered the resources to them. This was a paid service and our students were very happy with this service. Social media platforms should be utilized for promotion of Library Resources and Services.

GNIMS Learning Resource Centre is consistently helpful and responsive to its users by various social media platforms especially WhatsApp Groups and Emails which are the most prevalent methods of Communication.

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# **Vulnerability of Information Education and Learning Opportunities for Working Adults in Japan and Presentation of Model Curriculum**

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## **ABSTRACT**

In society in general, transactions via the Internet and work from home are on the rise, and the digitization of administrative procedures is progressing. However, many working people are in a state of not being able to cope with the gradual computerization environment. The problem is not limited to the "information vulnerable," represented by the elderly, but it also applies to middle-ranking adults who received information education in the early stages, but they do not have the opportunity to re-educate information learning.

In this study, in view of the above social background, we will confirm the knowledge about the information required of working people, and consider the state of lack of ability to respond to the request. Then, the importance of cultivating such knowledge and learning will be discussed.

Opportunities for information education and learning in working people, their environments, mechanisms, and time are limited. Therefore, we seek the progress of this learning opportunity and search for learning methods and effective ways of learning. In addition, a model curriculum for information education and learning and business evaluation standards will be prototyped, and proposals will be made for their implementation.

**Keywords:** Information literacy, Information education, Recurrent education, Utilization of information and communication technology

## **INTRODUCTION**

### **Purpose of Research**

In recent years, Japan has developed into an advanced information and telecommunications network society, and the computerization of transactions and administrative procedures using the Internet is progressing. In order to respond to such social conditions, schools provide education on how to improve the Internet environment, how to operate major electronic devices, how to make programming, and so on. At the same time, information ethics and cybercrime countermeasure education were promoted, and the GIGA School was conceived and partially realized<sup>i</sup>. However, recently, such development has progressed, and there are many people (workers) who are not benefiting from it. Currently, while there are many mid-career employees, there are also many non-regular employees and potential unemployed people called the “employment ice age generation” (born between the 1970s and 1990s)<sup>ii</sup>. People with this attribute may not have received sufficient information education, may not be able to acquire information skills, and may be in a position where it is difficult to change jobs in an environment where informationization is progressing. We will confirm what level of ICT skills these people have, and consider what kind of information education, learning support, and environmental improvement are necessary. Regarding information education, some local governments hold workshops at public libraries. We will grasp the trial (actual situation) of information education for working adults including them, and discuss the possibility of developing information education. The purpose of this research is to propose a model curriculum for information education and learning for working adults based on the findings obtained from the survey. In addition, a model curriculum for information education and learning and work evaluation standards will be prototyped, and proposals will be made for their introduction. This paper also deals with related selected studies in Japan, but the number of such studies is extremely small, and this paper is a pioneering study on curriculum proposals.

### **Research Method**

Focusing on papers published in CiNii Research, we will conduct a literature survey based on the current status and methods of information education, research data, and materials from the Ministry of Education, Culture, Sports, Science and Technology. Clarify policies for information education and information learning with the Ministry of Internal Affairs and Communications.

## **NECESSITY OF INFORMATION EDUCATION AND LEARNING FOR ADULTS**

### **Related Laws and Social Environment**

The government implemented the Digital Procedures Law in December 2019. In order to improve the convenience, simplification, and efficiency of administrative procedures through the use of digital technology, the Basic Principles for Digitizing Administrative Procedures and the Principles for Online Administrative Procedures were established. In the outline explanation, the following three items are listed as basic principles for promoting administration using information and communication technology.

- (1) Digital First: Digitally and consistently complete individual procedures and services
- (2) ONCE ONLY: Information sent once does not have to be sent twice by him.
- (3) Connected One-Stop: One-stop implementation of multiple procedures and services, including private-sector services

This item also shows that information exchange is digitized and streamlined.



In addition, as necessary items for the principle of online administrative procedures, utilization of information communication technology in administrative procedures, information system development plan to realize digitization, correction of digital divide, promotion of information utilization, etc. are included. I'm here. I am here. I am here. I am here. I am here.

Of these, the utilization of information and communication technology in administrative procedures refers to the principle of online administrative procedures. In principle, administrative procedures such as applications and notification of disposition based on applications will be conducted online, and local governments will be obliged to make efforts. In addition, it is said that electronic signatures, identity verification at the time of electronic payment, and fee payment will be done online.

In addition, the government has set a goal of "digitalization that is friendly to people and leaves no one behind," and has shown a positive attitude toward digitalization.

For this reason, it is believed that in the future it will become common to use digital technology to carry out administrative procedures online. This item promotes the use of information and communication technology in private procedures, and is expected to expand the use of digital technology in the private sector as well.

This means that all working adults need to adapt to digital technology as it becomes the norm in everyday life.

### **Working adults ICT Skill Levels**

Opportunities for information education and learning in working adults, their environments, mechanisms, time, etc. differ from person to person, and there are temporal and spatial constraints. With this in mind, we will be moving forward with this learning opportunity as we explore ways to learn and how to learn effectively. The Ministry of Internal Affairs and Communications recently announced the survey results of ICT (Information and Communication Technology) skills in the "2021 Communications Usage Trend Survey."<sup>iii</sup> This survey clarified individual ICT skill levels by gender and age. Many of the test items, such as "copying files, copying and pasting text and diagrams" and "connecting devices such as printers and cameras to computers," are skills possessed by people who do desk work. In this survey, for all items, the percentage of people who answered "able" decreased as the age group increased from the 20s to the 30s. Also, when comparing men and women of the same generation, the proportion of women aged 50 and over is lower than that of men. Depending on the question item, there are items that are 10% to nearly 20% lower, and there is a difference in ICT skills between men and women. Furthermore, looking at the age group when the proportion of those who responded that they could do it began to fall below 50%, among men aged 65 to 70, 3 out of 8 items fell below 50%. In addition, in the age group of 70 years and over, the result is less than 50% in all items. Among women aged 50 and over, 5 out of 8 items are below 50%. This woman is in the pre-elderly age group and more than half do not have these ICT skills of hers.

### **INFORMATION LEARNING ENVIRONMENT for WORKING ADULTS**

From fiscal 2021, the Ministry of Internal Affairs and Communications has budgeted for the "Digital Utilization Support Promotion Project"<sup>iv</sup> and has been providing subsidies to private businesses to hold "seminars" to support digital utilization, mainly for the elderly. It aims to fix the opportunities and capabilities associated with digital exploitation. In business organizations he has two types. One of them is the "National Expansion Type" implemented at mobile phone shops by the four mobile carrier groups of NTT Docomo, KDDI, Softbank, and Rakuten Mobile. The other is the "regional cooperation type" that cooperates with local governments in public places. There are two types of content. One of them is

a basic course where you learn the basics of how to use your smartphone, such as how to turn it on and how to make a call. The other is an applied course on how to apply for and use a My Number card using an app that allows you to learn administrative procedures on your smartphone. This project focuses on content that directly relates to people's lives.

As a support system for each municipality, smartphone and computer classes are posted on the homepage of each municipality's city hall. Classrooms and lectures held at community centers and public facilities run by the city differ depending on the municipality, such as the content, the number of times held, and whether or not there is a tuition fee. As a result, there is also the problem of not being able to receive a high-quality education that satisfies all applicants.

Lectures are also held at libraries and lifelong learning centers. From basic operations using Excel to creating graphs, the content varies in difficulty depending on the course<sup>v</sup>.

One way is to self-study using the materials posted on the website of the Ministry of Internal Affairs and Communications. In 2013, the contents were enriched not only about the benefits of the Internet and examples of its use, but also about how to use the Internet effectively and points to note. The basic content has a video version and a slide version, and can be used by those who are easy to learn.

## **RE-EDUCATION CURRICULUM**

### **Model Curriculum**

It is desirable that both face-to-face education and self-study be prepared as the form of actual education and learning in the model curriculum proposal, and that students can choose either to learn information education. It is hoped that this will partially solve the problems of time constraints and lack of educational personnel.

The following items will be considered as model learning guidance policies for developing information ethics, which are lacking in information education and learning among working adults, and basic skills related to ICT and information utilization that are required in society.

- (1) Significance of information education and learning (social environment and information education)
- (2) Basic operation of equipment
- (3) Learn information morals, media literacy, and security
- (4) Critical thinking ability

We propose the flow of the program using the model curriculum in the table below. By starting learning and reviewing from familiar topics, we aim to improve the memory of what we have learned and to use electronic devices to research things and exchange opinions.

### **Flow of the Study Program**

When creating the curriculum, we will refer to videos of smartphone classes provided by Softbank and au and incorporate basic smartphone operations and how to use apps into the learning. On the other hand, regarding basic content such as how to use information resources and media literacy, we mainly refer to videos and learning guidance contents for children and students released by the Ministry of Education, Culture, Sports, Science and Technology.

Regarding cyber cascades, cognitive biases, and learning critical thinking, we will take up actual cases such as SNS flaming, and clarify what kind of problems exist and what kind of thoughts and ideas

led to this incident. At the same time, the purpose of the learning content is to notice the bias of the community to which you belong, the bias of your own values, and the bias of your way of thinking.

In addition, in order to know the characteristics of information related to the use of information resources and action decisions, learn the characteristics of information in each media and aim to learn how to use information resources appropriately.

The flow of each learning program consists of three elements: (1) introduction, (2) development, and (3) conclusion (Table 1). First, (1) an introductory lecture is given to turn the learner's interest to learning, and the knowledge and abilities that can be obtained through learning are explained. By doing so, we foster an environment in which learners themselves are motivated to learn and can take on the challenge of learning. In addition, when continuing to study, it is possible to review the previous learning content to establish the learning content, or to conduct a pre-learning test to check the learner's level. can. Doing so will help you learn faster. Next, in the development of (2), we will learn about each theory in earnest. In addition to classroom lectures according to the content to be handled, practical training such as information retrieval using tablets and smartphones is incorporated into each lesson to ensure time to learn the basics of electronic device operation. Incorporate. By increasing the opportunities to touch electronic equipment, we will build a clue concept of knowledge based on applied operation and experience. Recognize that there are various values and ways of thinking such as those of third parties, recognize that it is necessary to make judgments based on various information rather than dogmatic judgments, and exchange opinions and discuss among learners. As teaching materials, we will use smartphone classroom videos of four mobile phone companies engaged in digital utilization support promotion projects, as well as videos and materials published on the website of the Ministry of Education, Culture, Sports, Science and Technology. Learn media literacy. At the end of the course, (3) summarize the learning content, take a test to measure learning comprehension, and present what you noticed during the study. This will be the output field. Questionnaires and learning achievement measurements at this stage will be used as project evaluation indicators.

**Table 1. Flow of the study program**

<b>Flow</b>	<b>Purpose</b>	<b>Content</b>	<b>Remarks</b>
① introduction	By linking familiar events such as news and the environment with learning content, students are interested in learning. At the same time, understand why learning is necessary. In addition, confirm and review the understanding of the previous learning content to consolidate learning.	<ul style="list-style-type: none"> <li>• Small talk such as news</li> <li>• quiz</li> <li>• Test of previous learning content</li> </ul>	
② Deployment	main part of the learning content. Although the ratio will change depending on the unit and the content to be handled, we will practice using tablets, etc., exchange opinions and discuss, and learn from the perspective of learning literacy.	<ul style="list-style-type: none"> <li>• Lectures using textbooks</li> <li>• Listen to videos and perform basic operations and literacy</li> <li>• Tablets and smartphones Practical Examining Using Phone</li> </ul>	Utilizing videos created by the Ministry of Education, Culture, Sports, Science and Technology

		<ul style="list-style-type: none"> <li>• The learner himself/herself and the learner exchange of opinions</li> </ul>	and mobile carriers
③ Learning summary	Check the learning content and measure the degree of comprehension and the degree of learning fixation. In addition, I will follow up on the learning contents while watching the learners.	<ul style="list-style-type: none"> <li>• Opinion presentation</li> <li>• Summary of learning content</li> <li>• Confirmation test</li> </ul>	

As for the content of the model curriculum, the learning content can be roughly divided into three areas as shown in the table below. Each field is studied once, and as much as possible, related learning content is linked, and learning that is connected to actual life is performed.

The content of the model curriculum can be broadly divided into three categories as shown in the table 2 below. Each field is studied once, and related learning contents are linked as much as possible to conduct learning that is connected to real life.

**Table 2. Model Curriculum Learning Content Three Areas**

[Smartphone operation] Power on/off, volume control, phone, email, camera, map, Character input, voice operation, Internet use, addition of applications
[Information communication technology and society] Information retrieval, problem solving, information technology, information systems and services (POS systems, GPS systems, etc.)
[Media literacy and information morality] Basic knowledge of the Internet, etc., computer structure, personal information, security, characteristics of media, intellectual property rights, troubles between individuals, cybercrime, cognitive bias, cyber cascade, decision to use information resources

### Project Evaluation Using the Model Curriculum

In order to measure the effect of the project using the model curriculum developed in this research, we conducted a project evaluation for each course based on the following items and used it to identify future project issues. We will continue to improve and take countermeasures.

Project evaluation items include cost, location, format/scale, number of participants, learning content, learning outcomes/understanding (test scores and skill acquisition), learner's motivation to learn, learner's evaluation/satisfaction, students, etc. Include items such as what students are looking for, what they are interested in, and what they are thinking. Ratings are basically filled in with three symbols, A, B, and C. A indicates that the effect exceeded the plan and B indicates that the effect and validity were as planned. On the other hand, if there is no C, C will be filled in, and items with this evaluation will be used to improve the curriculum and determine measures for the next year.

In addition to recording budget and number of courses offered as input metrics, we also record outcome metrics such as number of participants and test results.

Based on these evaluations, we will consider and improve the form and method of information education. When outsourcing to a contractor, it can also be used as one of the indicators to judge the appropriateness of the contract content.

By conducting such evaluations for each project, it is possible to update the curriculum in response to the acquisition of the knowledge and skills necessary for the ever-changing advanced information and telecommunications network society. We believe that information literacy education for working adults can be effectively realized by developing an environment in which the necessary human resources are appropriately assigned.

## CONCLUSION

As a result of a survey on information education and learning for adults, it became clear that the support system for information education and learning for adults is inadequate compared to information education for children and students, which has been attracting attention in recent years. Even today, when the Ministry of Internal Affairs and Communications is supporting digital utilization and learning environments, the lack of learning content cannot be overlooked.

Through this research, we have presented the environment and support for systematic information education and learning for working adults in various environments. In addition to preparing an environment where those who want to learn can learn, scrutinizing the learning content is also an issue that should be considered in the future. In addition, there are many issues in publicity and promotion of participation among members of society who are not interested in the information field. It is hoped that the importance of such information education and learning will be understood, and that discussions on event proposals and public relations that will attract attention will spread.

In the future, I would like working adults to utilize the proposed model curriculum as a starting point for acquiring knowledge and skills in the information field. We would like each local government to build a learning support system for systematic education based on a model curriculum for learning information literacy comprehensively. It is expected that an environment will be developed in which people who have not been able to receive information education in the past can enjoy learning about the information field. In the future, I hope that the generation that has received information education will have an opportunity to update information and relearn the information field.

Considering information asymmetry, it is thought that information contains many biases. We believe that recognizing this bias and looking at information critically will lead to the development of a democratic society. A model curriculum proposed at the end of the study addresses these information biases and critical thinking. However, it does not mention detailed content or specific proposals for educational settings. Based on this draft, each local government needs to secure opportunities for information education and learning for adults as a concrete business plan while utilizing private business operators.

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## Note

<sup>i</sup> Ministry of education, culture, sports, science and technology. (n.d.). About the realization of the GIGA school concept. Ministry of education. [https://www.mext.go.jp/a\\_menu/other/index\\_00001.htm](https://www.mext.go.jp/a_menu/other/index_00001.htm), (accessed 2023-5-25)

<sup>ii</sup> It is said that behind the employment ice age is the recession after the collapse of the bubble economy from 1993 to 2004. According to the Ministry of Health, Labor and Welfare, this generation has a high percentage of unwilling non-regular workers. Looking at the data, the 2018 data shows that the proportion of all unwilling non-regular workers is 12.8%, and the proportion of the employment ice age generation is 14.1%. It is said that the number of freeters, etc. that existed in 2000 (approximately 880,000) decreased by approximately 360,000 (approximately 520,000) in 2018. On the other hand, it cannot be said that the number of unstable non-regular workers is small. Furthermore, the employment front worsened due to the Lehman shock that occurred in 2008.

<sup>iii</sup> Ministry of internal affairs and comnational statistics center of japan. (2022, May 22). Communications Usage Trend Survey / 2021 Communications Usage Trend Survey / Household E-Stat. Members Edition. [https://www.e-stat.go.jp/stat-search/files?page=1&layout=datalist&toukei=00200356&bunya\\_1=11&tstat=000001165891&cycle=0&tclass1=000001165894&stat\\_infid=000032203958&tclass2val=0](https://www.e-stat.go.jp/stat-search/files?page=1&layout=datalist&toukei=00200356&bunya_1=11&tstat=000001165891&cycle=0&tclass1=000001165894&stat_infid=000032203958&tclass2val=0)

<sup>iv</sup> Ministry of internal affairs and comnational statistics center of japan. (2021, February 17). About Digital Utilization Support Promotion Business. Ministry of Internal Affairs and Communications of Japan. [https://www.soumu.go.jp/main\\_content/000734080.pdf](https://www.soumu.go.jp/main_content/000734080.pdf)

<sup>v</sup> For example, at the Nara Prefectural Library and Information Center, PC classes and IT support days are held. The PC class in 2021 will be held in the form of the "Sabogawa Town Development School Computer Class", and the contents of the public recruitment will be 15 people on a first-come, first-served basis. ing. The course will include creating slideshows using Microsoft Office Word, Excel, and PowerPoint for presentations.

# Dewey Decimal Classification based Ontology for Automatic Book Classification System

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## ABSTRACT

Knowledge management using ontology for book classification properly is essential because the automatic classification of text has become the most important analysis area because of the exponential growth of digital content, and the manual or semi-automatic system of organization could be more effective for classification. Knowledge management is difficult if there is no knowledge stored properly. It should get the right book to gain the right information to gain knowledge from books. So for that, manual and semi-automatic classification is extremely careful and effortful. This speedy growth of knowledge within modern technology leads people to arrange text materials in simple to access ways. The rapid growth of information within the present situation leads people to arrange text materials in several ways. This research uses DDC (Dewey decimal classification) book classification method to classify the book with its topic and automated book classification. Identify synonyms and classify books properly by using ontology. The methodology of this research is to select the classification scheme of the book, extract a hierarchy of classes for this scheme and, build an ontology for the book scheme, identify synonymous based on the ontology, then classify the book with the book's topic. The result of this research is to classify the book based on the book topic from that it can classify the book in a proper manner. From the system of this research, it can be automatically classified the book properly. Knowledge management and knowledge sharing can be done efficiently by using this system.

**Keywords:** Ontology, Automated system, Book classification, DDC

## INTRODUCTION

The automatic classification of books has become an important analysis area because of the exponential growth of digital content, and the manual or semi-automatic ways of organizing data are ineffective. Organizing the text in manual and semi-automatic classification is extremely careful and effortful is done nowadays. However, there are misclassifications because of the need for more clarity of documents and the methods of classification schemes used. The total number of data accessible in printed and electronic formats has increased dramatically every second. This speedy growth of knowledge and data in the modern world leads people to arrange text materials and ways to access efficiency. The rapid growth of information within the modern world leads people to arrange text materials in several ways to access them. Even though the arrangement of text, to some extent, is the



potential to classify, it still needs to be improved to access the relevant materials because of the need for more techniques that are followed in categorizing and composing them (Wijewickrema & Gamage, 2013).

Furthermore, to overcome this situation, standard book classification schemes such as Dewey Decimal Classification (DDC) are used to accomplish this goal. The inherent flaws in natural languages might succeed in several problems within the classification method. Specifically, the vocabulary differences in natural languages increase the quality of classification. The word 'ontology' in computer science also classified the below 'ontology' in philosophy. In turn, it affects the probability of the document that is being found. The time spent and energy spent organizing the materials are also high in traditional document classification methods. Additionally, digital documents increased quickly, and the demanding simple and cheap mechanized methods are efferent.

## LITERATURE REVIEW

Researchers have proposed various methods of getting correct book results after feeding the topic to the new system. From the classification method, it tends to use a replacement algorithmic program developed by enhancing the basic type of an existing text classifier known as tf-idf (Wijewickrema & Gamage 2013). The results were obtained for the classification accuracy of the new text classification algorithm.

They were compared to solve this problem obtained for the essential tf-idf classifier. The researcher discovered that the recently developed classifier algorithm would get higher classification accuracy than the essential tf-idf classifier (Wijewickrema, 2012).

The Internet is playing the most critical role in communication and sharing of gain knowledge today. Current research on the Internet uses the world wide web for different kinds of tasks. Current WWW mostly restricts information processing to manual keyword searching, which is why irrelevant information is retrieved. This problem can be overcome by using the semantic web. (Okoye et al., 2016). Ontology plays a vital role in achieving the goal of the semantic web.

The librarians use classification schemes in libraries to organize digital resources or physical material. These schemes consist of hierarchies of topics that define the controlled vocabularies to explore collections. (Banu & Rahman, 2013). The most common classification schemes are Universal Decimal Classification LCC and DDC, among which DDC is widely used in most libraries (Qi Yu & Wang, 2013). An ontology is a formal, explicit description of concepts in a domain of discourse classes, properties, and individuals describing each concept's various features, attributes, and restrictions on slots. An ontology, together with a set of individual instances or individuals of classes, constitutes a knowledge-based. Some issues are found in classification schemes when expressing them in Simple Knowledge Organization System. Zeng et al. suggested that these issues can be solved and implemented in Protégé editor, and ontology can be developed (A Khan, 2014). The literature lacks classification-based semantic web ontology research, and very few researchers have tried to design and analyze such mechanisms. Some authors, like Medina et al., have tried to establish the basis of this methodology. Some instances are as follows. The use of classification schemes to model ontologies is presented (A Khan, 2014). Classifications are also used for web pages and other kinds of electronic media. Giunchiglia et al. propose a Formal classification to develop some lightweight ontologies. Classification-based ontologies can be very helpful for practically implementing the semantic web. Giunchiglia et al. proved their fact by where the author converted the generic classification schemes to OWL ontology (Imai A, 2003). Library classification schemes can potentially manage the electronic data of web organization knowledge. Library professionals have been applying the classification schemes in many internet-based projects and benefiting from this (Imai A, 2003).

Vizine-Goetz D concluded that DDC based browsing is very effective in the internet world because the classification schemes can cover all the topics of internet schemes. The authors' main focus is to analyze the most common properties between Internet and DDC schemes. Classification schemes are mostly used in libraries. For libraries, there are LMS based on relational databases. Such databases can be easily converted into ontologies (Ayesha & Khan, 2013). Also, an example ontology LMS (Allahyari & Kochut, 2015) is available, which uses ontology's concepts, properties & restrictions. Ontology for LMS has been developed in this research work which uses a novel approach based on the DDC scheme. The main focus of the research paper is to use DDC scheme classes as concepts. The research uses some rules to derive the library ontology. A simple seven-step algorithm is presented that shows the working and interactions of the proposed system. Previous research also presents the system implementation architecture, which describes ontology in the semantic web application for LMS (Ayesha & Khan, 2013). The research tested the ontology with the reasoning service provided by the Protégé editor. At the end of the research, results were generated with SPARQL queries in protégé using its facility of querying ontology. The DDC divides the books into different classes, which are essential from an ontology building point of view. The DDC is the favourite method librarians use to classify books and is the standard way of book classification. The ontologies have the potential for modeling the classification scheme. Ontologies use concepts, individuals, properties, and restrictions that help semantic search engines. Ontology can be written in different languages, such as XML, XMLS, RDF, RDFS, and OWL (Dou et al., 2015).

## METHODOLOGY

This classification is an approach for developing an ontology for the book, wherever each category of the DDC scheme is divided into class and subclass relations. Ontology names these classes Level-1, Level-2, and Level-3 until additional general to specific class reach. It used protégé Editor [Protégé - 5.5.0] for the development of the ontology. It considers a factor because of the main class of ontology. The 'Thing' is the domain that is the superclass of each class. For this research, physics is used as the domain of ontology. After building ontology, implements a system for extracting class hierarchy for user input topic. Furthermore, meanwhile, WordNet is used to identify synonyms word of the input topic, and from synonyms, the system implements to classify the book according to the user input book topic. This research used this methodology to build an automated book classification system.

Below Figure-1 shows class hierarchy for physics schema.

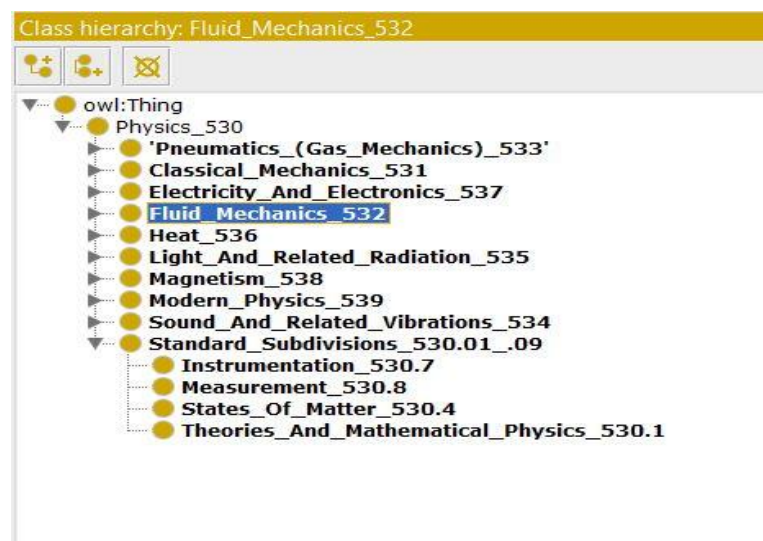


Fig. 1. Class hierarchy for physics schema

In this research, the book ontology builds where each category of the DDC scheme is divided into class and subclass relation. Ontology names these classes as Level-1, Level-2, and Level-3 until more general to specific class reaches. It used Protégé - 5.5.0 for development of the ontology. It considers Thing as the main class of ontology.

The 'Thing' is a domain which is the superclass of every class, and then it adds Physics Domain class name Physics under Thing as shown below:

Thing

- Physics\_530
  - a. Pneumatics\_ (Gas Mechanics)\_533
    - i. Statics;\_Mass,\_Density,\_Specific\_Gravity\_533.1
    - ii. Aeromechanics\_533.6
    - iii. Dynamics\_533.2
    - iv. Kinetics\_Theory\_Of\_Gases\_533.7
    - v. Vacuums\_533.5
  - b. Classical\_Mechanics\_531
    - i. "Dynamics,\_Statics,\_Mass\_And\_Gravity,\_Particle\_Mechanics\_531.1"
    - ii. Energy\_531.6
    - iii. Friction\_And\_Viscosity\_Of\_Solids\_531.4
    - iv. Mass\_And\_Gravity\_Of\_Solids;\_Projectiles\_531.5
    - v. Solid\_Dynamics\_531.3
    - vi. Solid\_Statics\_531.2
    - vii. Statistical\_Mathematics\_531.015
  - c. Electricity\_And\_Electronics\_537
    - i. "Electrodynamics\_(Electric\_Currents)\_And\_Thermoelectricity\_537.6"
    - ii. Electronics\_537.5
    - iii. Electrostatics\_537.2
    - iv. Philosophy\_And\_Theory\_537.01
  - d. Heat\_536
    - i. Effects\_Of\_Heat\_On\_Matter\_536.4
    - ii. Heat\_Transfer\_536.2
    - iii. Philosophy\_And\_Theory\_536.01
    - iv. Radiation\_536.3
    - v. Specific\_Heat\_536.6
    - vi. Temperature\_536.5
  - e. ...
  - f. ...

Likewise, the ontology hierarchy build

For all classes, they are disjoint classes. The individual or the instances varies from the classes. In DDC classification for every classes and subclass, it gives its own classification number.

1. Select the directory where ontology is to be stored.
2. Start building ontology under main class “Thing”.
3. Write the names of classes and subclasses under the main class.
4. Start adding individuals for each class.
5. Add object properties.
6. Add data type properties.

In this research, the ontology store in Wampserver to performed the ontology. In this research “Thing” is defined as the defaulted superclass of the ontology creation. For that super class the class hierarchy started.

The figure-2 shows the classes and subclasses of the book ontology.

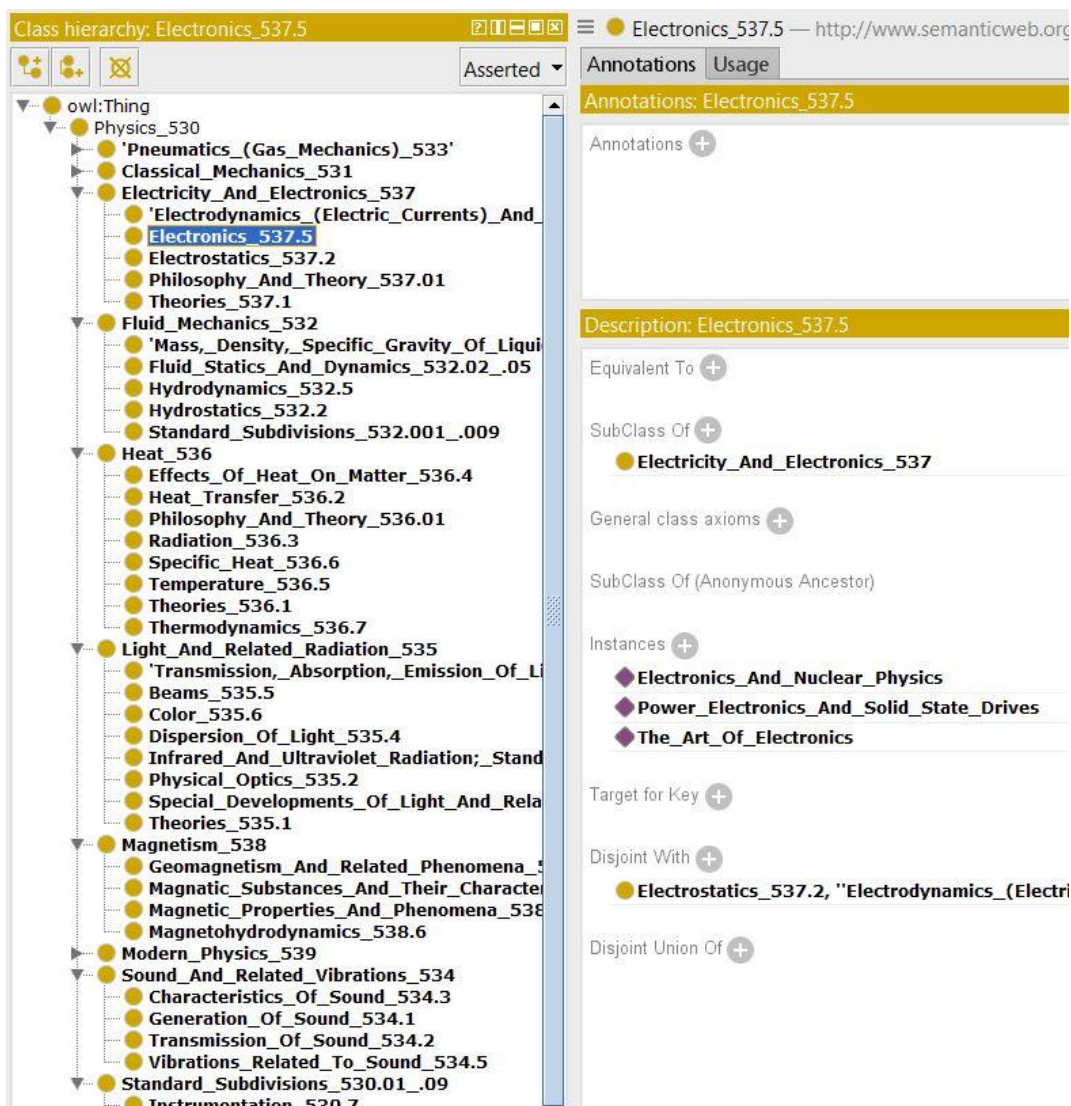


Fig. 2. The classes and subclasses of the book ontology

The list of book individuals has in book ontology. Topics of the book were taken as the individuals of ontology.

In the figure 3 it shows the individuals of the book ontology



- ◆ 'Physics,\_basic\_Electro\_Magnetism'
- ◆ 'Physics,\_Sound'
- ◆ A\_Dictionary\_Of\_Physics
- ◆ An\_Introduction\_To\_Equilibrium\_Thermodynamics
- ◆ Atomic\_Physics
- ◆ Blackbody\_Radiation
- ◆ Chemical\_Engineering\_Thermodynamics
- ◆ Classical\_Electrodynamics
- ◆ Computational\_Physics
- ◆ Consise\_Chemical\_Thermodynamics
- ◆ Dictionary\_Of\_Physics
- ◆ Dimensional\_Analysis\_Through\_Perspective
- ◆ Discovering\_Energy
- ◆ Electro\_Statics
- ◆ Electromagnetic\_Field\_&\_Waves
- ◆ Electronics\_And\_Nuclear\_Physics
- ◆ Engineering\_Fluid\_Mechanics
- ◆ Environmental\_Noise\_Impact\_Analysis
- ◆ Fundamentals\_Of\_Atomic\_And\_Nuclear\_Physics
- ◆ Fundamentals\_Of\_Classical\_And\_Statistical\_Thermodynamics
- ◆ Fundamentals\_Of\_Electromagnetism\_Phenomena
- ◆ Ganithaya\_2\_Dynamics\_2
- ◆ Geometrical\_&\_Physical\_Optics
- ◆ Golden\_Hydrostatics
- ◆ Group\_Theory\_Application\_To\_Molecular\_Vibration
- ◆ Heat\_And\_Thermodynamics
- ◆ Hydrodynamic\_Forces
- ◆ Industrial\_Control\_And\_Instrumentatio
- ◆ Introduction\_To\_modern\_Physics
- ◆ Introduction\_To\_Optics\_And\_Optics\_Imagine
- ◆ Introductory\_Nuclear\_Physics
- ◆ Mechanics
- ◆ Nuclear\_Physics
- ◆ Numerical\_Fixed\_Dynamics
- ◆ Physical\_kinetics\_Vol.10
- ◆ Physics\_Of\_Atoms\_And\_Molecules
- ◆ Power\_Electronics\_And\_Solid\_State\_Drives
- ◆ Principal\_Of\_Electricity\_And\_Magnetism
- ◆ Principles\_Of\_Electronic\_Cicuits
- ◆ Problem\_In\_Heat\_And\_Mass\_Transfer
- ◆ Quantum\_Electrodynamics
- ◆ Solid\_State\_devices\_And\_Circuits
- ◆ Temperature

**Fig. 3. The individuals of the book ontology**

## **RESULT OF THE CLASSIFICATION SYSTEM**

In using this classification system it can classify book according to the DDC method. In previous, the book classification is done manually by using the DDC method. But in using this system it can automate classify the book according to DDC classification based on using the build ontology. This knowledge-based system can efficient knowledge sharing. And also the system identifies the synonyms and classify the book in a proper manner.

Figure 4 shows the result of the system.

```

Output - BookClassification (run) x
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more info.
Super=null
Array List:[<ModelCom  (:#Fundamentals_Of_Electromagnetism_Phenomena @rdf:type :#Electricity_And_Electronics_53
super=http://www.semanticweb.org/vishw/ontologies/2019/0/untitled-ontology-14#Pneumatics_(Gas_Mechanics)_533
<ModelCom  (:#Fundamentals_Of_Electromagnetism_Phenomena @rdf:type :#Electricity_And_Electronics_537; :#Fundame
http://www.semanticweb.org/vishw/ontologies/2019/0/untitled-ontology-14#Dynamics_533.2
Vacuums_533.5
Super Class List :[http://www.semanticweb.org/vishw/ontologies/2019/0/untitled-ontology-14#Pneumatics_(Gas_Mech
BUILD SUCCESSFUL (total time: 4 seconds)

```

**Fig. 4. The result of the system**

In this figure, it shows the output of the system based on the user input book topic.

In this research the ontology based book classification build due to the misclassification of the document. But in using this system it identify synonyms by WordNet and for the input topic it identify the proper place that book should keep by identifying the difference vocabulary of the naming convention.

## DISCUSSION AND RECOMMENDATION

In this research, researcher establish the research questions based on the literary review of this research. The objects of the research are established based on the necessity of the automated book classification system. The methodology of this research was build based on the previous ontology based classification “An Ontology-Based Fully Automatic Document Classification System Using an Existing Semi-Automatic System” research of Wijewickrema, 2013. And the methodology develops for suitable for this research. In the object of the research is full filled by the system. The system builds to automated book classification in a proper manner. For automated book classification, it used DDC method to classify books in an efficient way. As the methodology of this research, the ontology creates based on physics scheme. From DDC classification ontology class hierarchy was build. Add properties and individuals from the library book database. From the system, the book classified correct by the book topic input. And the system fulfills the classification in the standard way and from that the knowledge management and knowledge sharing do in properly. The research objectives and research questions were full fill in the system. In this research to identify synonyms WordNet is used. As the topic differs from the authors naming word.so in such a situation the system have the ability to identify synonyms by using WordNet.

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# Inclusive University Libraries for Students with Disabilities in Vietnam

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## ABSTRACT

The inclusive academic library plays a vital role in everyone's business. Specifically for communities with disabilities, it brings great value in easily gaining the right of equal access to beneficial policies of the social mechanism, expanding capacity to reach out to the inclusion education of higher education systems around the world without discrimination. As one of the first-hand empirical efforts investigating the approaching role of the inclusive library within universities, the study examined how work, influence and impacts of this type of library contribute to cultivating accessibility of students with disabilities emphasized by equality rights, policy reforms, and opportunities for approaching higher education institutions. Moreover, the study examined the distinction between the factors of this type of comprehensive one and the type of other existing ones. A qualitative empirical observation was carried out with over 100 websites of libraries at universities of Vietnam. Results showed that both the type of inclusive library and the other ones motivated PWDs' benefits of equality rights, policy reforms, and opportunities approaching higher education institutions, which in turn built up the factors of the type of other existing libraries. The state of current existing situations directly intervened in the influence and impact of investment, corporate, and leader's attention on PWDs with university libraries of Vietnam. Theoretical and practical situations of the findings are considered.

**Keywords:** Inclusive library, People with disabilities, University of Vietnam, Academic library

## INTRODUCTION

In a modern and civilized society, especially for users with disabilities, their need for equality becomes more and more important than other ones. Having the same position as non-disabilities is the most essential thing in their life. Like the types of the different libraries, this inclusive one is also considered to be an important part and an ideal place for all levels of learners to gain. Regardless of who they are and live in any circumstances having opportunities to discover as well as finding available open-values equally. They all are also given the same right without suffering any discrimination (for example. Race, religion, sex, language, age, nationality, etc.) to access and get benefits from it. In education, it is also an indispensable part for innovating and enhancing the quality of inclusive education and training, an important part that represents different things for diverse forms of people, which make great contributions to their lifelong career and take them all to a real world that they wish.

Then, it can be recognized that there is quite a clear distinction between the type of this library and the other ones that are the target audience, namely people with disabilities (PWDs). In a research Anh's author shows six main types of disabilities that are classified by Government's Law including



Mobility disability; Hearing and speaking disability; Visual/seeing disability; Mental disability; Intellectual disability; Other disabilities/impairment. The same as above, Law also presents the severity of disability into three levels including 1. Persons with severe disability are those who are unable to support themselves in their daily activities; 2. Persons with moderate disability are those who are able to support themselves in some of their daily activities; 3. Persons with minor disabilities are those who do not fall under either type. Another possible distinction could add to that is the policies of government and associations, such as IFLA statements, law documents or terms issued. The Government's Law on Rights, Benefits and Privileges of PWDs guides that "States should have preferential treatment policies in every field to support them to access and use information and social services. Similarly, institutions, agencies, organizations, enterprises and individuals must comply with the provision of relevant legislation for PWDs as well as be responsible for providing orientation and counseling to help PWDs to their independent needs (Nguyen, 2018). Therefore, once learning characteristics and special needs of PWDs as well as reluctantly complying with government policies, universities are able to provide building models and products and services to users with standards and quality. Passing many rules and regulations is to ensure equality of opportunity for people who have limited accessibility to all existing areas of society.

The last importance could add is that it is the factor of inclusive education. According to the UN Convention on the Rights of PWDs affirmed that education can entrust PWDs by increasing their awareness of their choices and reducing their dependency and vulnerability (Nguyen, 2018). So, it can say that if universities of Vietnam want to be recognized as a prestigious educational institution or high standard quality education by the global community, they must meet fully the conditions and terms that are mentioned in the law documents of associations and the Vietnamese government as well as in the trend of Sustainable Development Goals (SDG).

Though these resources mentioned above are to serve the best purposes to library users, PWDs are not getting benefited on the same parlance as for them advancement in providing access is not going on in the same location of universities. Thus, considering the significant role of the type of inclusive library for disabled students, this study is carried out to investigate the building model (e.g. physical infrastructure and facilities) and products/services in academic libraries of Vietnam to find out the problems that students with disabilities face while accessing these resources. Comparing the type of this library to other ones that did, it believes that it is not only necessary for universities of Vietnam to reach comprehensive goals and sustainable development, but also for disabled students to achieve a brighter future.

## **DISCUSSION OF THEORETICAL BASIS**

The purpose of this study examines the importance and impact of the other ones compared with the type of inclusive library for disabilities. Theoretical basis is essential to find understanding regarding the background of this topic and also to become aware of the recent trends. Based on previous research across the globe related to the research topic to build up the understanding of the model of inclusive university library and come up with recommendations in the field of inclusive library work for higher education institutions and others.

Specifically, there is a little researched on the topic of this one around the world, particularly at the university level, no specific studies that were found in any articles by the author of the paper. One of the oft-cited definitions of inclusive library put in this study: "An inclusive library is a vital community resource, addressing the diverse information needs of all members in the community" (Moisey, 2007). Another research said that inclusive libraries work to create a safe framework for

personal conversations that can help to challenge prejudice, get rid of discrimination, prevent conflicts and contribute to greater human cohesion across social, religious and ethnic divisions. They have been found effective in increasing positive effective attitudes towards working in diverse groups (Sharif et al., 2020). In Vietnam, there has been no research on this type, majority of these were undertaken in groups that showed obvious impairment such as the visually impaired in public libraries or in the center for the disabled. By contrast with this type, the academic library was described in many articles. A typical cited-report of Wikipedia, “The academic library is a center or building that is attached to campuses of a higher education institution and serves two complementary purposes: to support the curriculum and the research of the university faculty and students. Academic libraries must determine a focus for collection development since comprehensive collections are not feasible. Librarians do this by identifying the needs of the faculty and student body and the mission and academic programs of the college or university. Consequently, this means that the library is located in the campuses of universities that aim to serve the goals and mission of those. However, this statement has still not responded with the general developing goal of social, so far.

Going on to another next influence on the type of inclusive model which is typical features of PWDs. According to the World Health Organization (WHO), “Disability is an umbrella term, covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations”. More than 1 billion people around the world have some form of disability (or 15% of the world’s population (Rayini, 2017). A statistic issued in 2016-early 2017 by the Vietnamese General Statistics Office, the total number of PWDs are 6,225,519 people nationwide, including 5,553,860 people aged 18 years and older (General Statistics Offices, 2018).

And so finally then, the main factor directly affected awareness of government and community towards disabled people is the policies. For instance, according to the IFLA (International Federation of Library Associations and Institutions and UNESCO (the United Nations Educational, Scientific and Cultural Organization) is every library must provide proper services for those who do not have easy access to them, such as the mentally and physically disabled, the ill and imprisoned (Rayini, 2017). Also, a Joint Circular No.42/2013/TTLT-BGĐT-BLĐTĐBXH-BTC of the Government of Vietnam issued in 2013 by the three ministries mentioned the policies on scholarship and support for disabled people in terms of means and learning materials.

It is quite clear from theoretical mentioned issues on the impact and influence of the model of the various kinds of other existing libraries that distinguish from the inclusive library, which students with disabilities are not able to access inclusive learning and higher education environments due to lack of activities and accessibility issues. As far as, the study concerns the helpfulness of the type of inclusive library to provide suggestions to overcome the problems experienced by disabled students at the academic library of Vietnam.

## **OBJECTIVE AND METHODOLOGY**

The purpose of the study is to identify the typical characteristics of the type of inclusive library as a basis for clearer understanding of the role, the impact and the influence of this type towards PWDs. From that point on, providing a description of the state of current existing situations of the type of other libraries at universities of Vietnam. Distinguishing from the factors of both examined to consider suggestions for academic libraries and educational organizations of Vietnam, so that they make greater orientations to introduce remarkable improvements in work toward benefits of students with disabilities (SWDs) in society and the future.

The study is conducted by investigating the theory of previous research and using empirical observations to determine the influential factors in the typical characteristics of the type of inclusive library. Which compared with other types including the features of library users, the policies, the structure of the library building, and its impact on PWDs, investment, corporate, and leader's attention. Total are over 100 public and private libraries at Vietnam universities examined within work of library buildings for physical facilities and infrastructure of library, products and services through its website.

## **THE STATE OF CURRENT SITUATIONS**

The total number of 242 universities presented in a statistic (Nguyen, 2022), the study investigated among work of 100 public and private libraries through websites and practical experiences. The result found that almost all academic libraries of Vietnam meet basically minimum requirements and goals of institutions. However, the structure of the library building as well as products and services provided are only reaching target students who are non-disabled. Regarding products and services, all the libraries in public universities do not even have any special service and standard equipment for students with disabilities (SWDs), even get any librarians support when needed. By contrast, there are very few libraries in private academies that have services delivered, but lack adequate provisions when asking for such as infrastructural building, auxiliary equipment, facilities, and physical environments. Van Lang University, RMIT University, and Thang Long University are examples.

Moving onto the business of SWDs who attend universities such as impaired mobility, vision, deafness, etc. Despite the number of disabled people tend to grow rapidly in recent years, a number of individuals that belong to this group attending higher institutions is not much. Previous research reports also showed that the vast majority of those are in the specialized vocational training center or the disabled center through the agencies of the local government and charitable associations. According to a report, MOET has not collected such data from colleges and universities, however, based on the information of WHO, only 0.1% of PWDs in VietNam obtain a Bachelor degree and 6.5% have Certificate of Professional Practicing (Nguyen, 2018).

Going on to another next outcome which could add is that PWDs are experiencing numerous difficulties in their life. Meanwhile, they attempt to deal with seeking to assert their position in a modern, complex and competitive world dominated by able-bodied people, on the other hand, they also try to encounter problems of both physical and mental conditions to access a higher education environment. Although recently the Government and organizations of Vietnam have a greater awareness of the rights of community groups with disabilities, the policies represented towards inclusive development of them have not been much.

As the final result of this study that could add is consciousness of educational institutions and communities including authority in general is still not high. Most thought that as there will not make any profit from these disabled groups, investing in the establishment of a standard building or separated products and services to serve only this audience group at every location is currently considered unfeasible and costly to invest.

In closing, the results of observations of the current situations show that the factors such as the role of the inclusive library, awareness of communities, and the policies of Government could be considered to be big influences on the success of organizations, on comprehensive development of PWDs, and on sustainable development of society. Thus, this can prove that moving towards the model of the inclusive university library for SWDs is really necessary for every higher educational institution of Vietnam, especially at academic level. To help make more outstanding improvements and have

clearer development orientations in the future, the study recommends three primary elements below based on the issues of the current existing state.

## **RECOMMENDATIONS FOR INCLUSIVE IMPROVEMENT**

It is necessary for all users including people with different forms of disabilities in inclusive education to have an accessibility to collections and services smoothly as well as make them approach and enter the library building easily and safely. For instance, people in a wheelchair can reach all departments, blind or partially sighted people are able to walk with a crutch or an assistive tool without encountering obstacles on their way. Deaf people can find any support or communicate with librarians. Individuals with an intellectual impairment are able to easily find information and other materials in a variety of different formats.

### **1. Physical facilities and infrastructure of library**

Accessible outside and inside the library building should be designed sufficiently, the typical components of a library campus can consist of pathways for wheelchairs, elevators systems, standard restrooms, stairs, special rooms, parking locations, automatic equipment and modern technical devices including both software and hardware. All those come complete with the information and technology networks for connection. However, in order to do that well, the economic resource of the library is the deciding element in the developing process.

- For the outside of the site should be provided a disabled parking bay available near the library's entrance, ramps with railing at its main gate, and a proper passage to the entrance with non-slippery ramps. Equipped with integrated devices and assistive technologies like door openers, fire alarms, telephones are also useful for library users with disabilities (UWDs) to approach the inside of library physical parts.
- The inside of the building that should be included clear signs/symbols in pictogram formats that be located in visible sections to get easy to have a look and understand, specialized furniture with various and compatible heights, reachable items that is closed to, or keep pacing with the actual capacity of UWDs towards access to printed materials easily as well as getting assistance immediately. Additionally, audible and mobile alarm networks connect with the sound to hear announcements in case of emergency situations, window signs and induction loop systems to confirm the identity of forms of UWDs clearly. Moreover, with something of the same kinds, libraries should be installed with specialized computer systems which are connected with smooth network infrastructure, in order to interact with special needs through support services regardless of the certain or remote location. Finally, it is also remarkable that the structural and ground space must be wide enough for them to move, leave, and get through.

Consequently, inclusive facilities and infrastructure are essential factors that both provide accessibility sufficiently towards accommodating the level of satisfaction with needs and develop personal skills regardless of whoever is in any region, or territory.

### **2. Collections and services**

Library collections and services are power tools to greatly assist in overcoming the difficulties faced, and impact the overall and lifelong learning process of disabled users. Designing or the development of collections and services not only reflects the diversity in the community, but also gives equal opportunities in an inclusive educational environment, approach for providing the right of multi-access

to the policies, special educational programs, and government benefits as well as wholly owned knowledge and information resources that are delivered by library.

Focusing on the current situations, the capabilities of financial and human resources, the characteristics and needs of various existing-user groups with disabilities are influential and deciding factors to build relevant materials/adequate collections and services towards special needs. Especially be important in the digital age, apart from traditional categories and forms, offering electronic collections and digital services to individuals with disabilities are not only necessary for changing the ways of accessibility, increasing the level of information literacy, establishing visual environment and education, but also reducing the need of the disabled to travel or visit physical repositories and library spaces. In combination with adaptive devices and assistive technology equipment in the advent of technical science to help facilitates easy utilization of library collections and services efficiently, and optimally in diverse formats. Thus, in order to enhance the abilities of disabled people to use the library fully and independently, and also gain benefits of those available types. Which will be helpful in assisting them in getting higher education and better jobs.

### ***2.1. Collections***

Collections specifically produced for these disabilities that may include types of alternative materials in different formats such as leaflets, talking/audio books and newspapers and periodicals, easy-to-read books, Braille books, large print materials, E-books, tactile picture books, and video/DVD books with subtitles and/or sign language (Irval & Nielsen, 2005).

### ***2.2. Services***

The library readers service section covers special corresponding services for UWDs. They may include home delivery service, outreach/mobile services for disabled users getting poor/serious condition or living in remote areas; sign language interpretation services for storytelling, book presentations, talks and discussion groups, among others; specialist reading service for patrons with reading difficulties; consultation service for providing orientations to overcome barriers encountered in the libraries; economic reference service is to provide pin-pointed, exhaustive, expeditious service through users' questions about the library to respond to them at the same time by email/SMS/Apps; loan library service for providing the demand materials from other libraries; circulation service for offering to access to all course books and reference books be located in the special room in which equipped with adaptive facilities and assistive technologies; and last one is training service to learn on how to use library in certain places or at home through website or other support tools.

## **3. Activities**

### **3.1. Training staff**

It is important for all staff to be knowledgeable about various disabilities and how to assist users best. Training and educating librarians is to increase the level of their awareness, and understanding about forms of disabled people in the library towards supporting actively through physical obstacles that their disabled users are experiencing, and having strong orientations towards studying aims of UWDs in the future. That present also partly their responsibility for contributing to overall social growth. Examples of appropriate staff training and education are

- Sending staff in-depth courses on special needs of disabled groups with specialists in the medical and psychological field so that they have exemplary behavior and are favorable towards the disabilities;

- Closely cooperating with vendors supplied specialized facilities in training programmes for librarians who worked in special departments. Through practicing, help them learn more how to use adaptive equipment and assistive technologies competently and professionally in the era of ICT and gain much more skill at serving user groups with disabilities;
- Strongly encouraging staff to attend workshops and conferences that are held by educational institutions or sponsors through discussion on the subject of library UWDs. As a result of gaining practical experience in understanding the special needs of patrons with disabilities, staff can make large contributions to developing and building library works.

### **3.2. Cooperation with partnerships**

Cooperation activities are essential for all libraries to maintain and expand their works, which lead to achieve enormous success further in assisting and serving UWDs as well as constituting big improvement in both their present and future life. Based on the difficulties and obstacles of both sides that faced such as lack of the budget to invest in constructing library buildings and training staff, lack of specialized equipment and modern technologies that are not normally associated with giving the complete satisfaction of special needs, lack of leaders' knowledge about how to implement fully policies towards UWDs according to the rules of law so libraries come up with planning to work closely in collaboration with others including

- Cooperation with educational institutions, non-governmental organizations and governmental organizations regardless of donors in order to earn based-opportunities for both UWDs and staff with poor conditions in the process of studying and improving their competency as well as the quality of their entire life. Something for them may be scholarship programmes, projects, disability support and right funds, etc.;
- Close collaboration with philanthropic organizations, sponsors, or companies working in the field of ICT to call for a grant aid of budgets, specialized facilities and physically infrastructural improvement to contribute for inclusive and sustainable development of library building in a model of new society. Doing this is the same way that libraries work with different publishers to create special collections for UWDs in various formats;
- Collaboration with local government agencies to have a change in attitude about the good value of inclusive libraries for community groups with disabilities as well as make adjustments in coherent policies and regulations that applied for PWDs according to substantive law of the Vietnam Government;
- Establishing strong connections with inside community groups who can be either lectures, faculties, departmental staff, or outside partnership libraries to provide real assistance in dealing with all actual barriers of the disabled immediately and anywhere towards helping further reduce pressure on librarians who lack practical experience in serving UWDs;
- Finally, contact with all enterprises to bring UWDs career opportunities within their capacities with a high level of salary after they graduate from school. As a result, consultative and vocational guidance is essential for the disabled to access the placement market and make the right decisions.

### **3.3. Other activities inside library**

- Book clubs improve significantly the reading capacities of user groups with intellectual and vision disabilities through volunteers with non-disabilities;
- Annual workshops and conferences should happen in the library once every year. Meeting and communicating with the specialist groups in the different fields make the group of UWDs feel

more open and confident about asking questions and assistance when they come to the library as well as access to library products and services easier than those did;

- Based on related events or the chosen subjects to hold exhibition/display of materials, which is a way to introduce to patrons regardless of disabled group all new resources and further facilitate learning easily about how to find the location of those on shelves and other sections in the library.

Some above suggestions of this study will help make more specific contributions to a vital part of society. Firstly, the community groups of disabled-students will leave the gap between disabled people and non-disabled ones in accessing the values and benefits provided to support the process of their learning in an environment of inclusive education. Additionally, helping them to overcome barriers and obstacles which they are experiencing and gain a better future. Secondly, this study will support library and educational communities including leaders, staff, users with non-disabled, and other stakeholders to raise further consciousness of providing treatment to this individual group when asking for use of all things in the learning location. In addition, to become more acutely aware of roles, responsibilities for understanding special needs basing on their different characteristics. Finally, this will attract much more organization's attention and government's concern to the disabled community in society to provide adequate policies as well as making more feasible adjustments in law documents, so that exclude the social prejudice against this group towards building an inclusive and sustainable society in the future.

## CONCLUSION

An inclusive library goes beyond existing regulations to seek excellence for all aspects such as physical facilities and infrastructure, collections and services, and activities. Through it, all previous barriers and challenges of users with disabilities can be overcome easily and no longer feel anxious in the face of all obstacles around them. Thereby, helping them make the most of the value of the library's resources in developing their actual capacity towards improving their quality of life in the future. Seeking equal treatment of PWDs should create more favorable conditions for them to gain access to policies and benefits of inclusive education and sustainable society in the future.

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# Exploring User Behavior and Needs in Using the Asian Institute of Technology Institutional Repository

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## ABSTRACT

**Objective:** This study aims to explore user behavior and needs in using the Asian Institute of Technology Institutional Repository (AIT IR).

**Methodology:** This paper is a case study. Research subjects were AIT graduate students. A Google Form questionnaire was distributed via email, resulting in the collection of 233 responses over a span of 15 days.

**Finding:** The study found that students primarily become aware of AIT Institutional Repository through the Library Website, Library Orientation Program, and recommendations from friends. The objectives of using AIT IR include research exploration, accessing and downloading relevant academic resources, and conducting literature searches and systematic reviews. They prefer AIT IR over other sources due to easy access to full-text research materials, field-specific browsing, and the absence of paywalls or subscription fees. Students often use AIT IR for literature reviews, research methodology, and topic identification, as well as seeking and accessing theses, dissertations, and research reports. They prefer browsing by title, subject, and school, and also perform actions such as downloading, viewing, and saving materials when using AIT IR. Users highly value easy data access, availability of research materials, up-to-date content, open access, collaborative knowledge sharing, citation support, personalized alerts, copyright compliance guidance, data deposition, and user support. External user access and downloads are also considered moderately important. Overall, the study highlights the user consensus for open access and the importance of a research data repository, offering insights to enhance AIT IR's effectiveness and benefit AIT and similar institutions.

**Implications:** These findings provide valuable insights into AIT students' behavior and needs for AIT IR, enhancing the repository's effectiveness and benefiting AIT and other institutions offering IR services.

**Keywords:** Institutional Repository, User behavior, User needs

## INTRODUCTION

An institutional repository is an online platform that collects, preserves, and shares a research institution's digital intellectual output (Dhanavandan, 2020). It serves as a centralized space for storing various academic works such as documents, articles, textbooks, conference proceedings, theses, and more (Kaladhar et al., 2018). The primary goal is to enhance accessibility, visibility, and discoverability

of research (Plutchak & Moore, 2017) promoting knowledge dissemination and collaboration (Kodua-Ntim, 2021). Institutional repositories also contribute to long-term preservation and archiving of academic works (Tiwari & Gandotra, 2018) while offering features like metadata descriptions, search functionalities, usage statistics, and digital rights management (Scherer et al., 2020). They can integrate with other research systems and platforms for enhanced discoverability and interoperability. Additionally, institutional repositories allow for open sharing and use of educational resources in teaching and learning processes (Santos-Hermosa, 2023).

The number of institutional repositories worldwide has been steadily increasing. In 2020, there were around 5,495 repositories, which grew to 5,633 in 2021 and further to 5,836 in 2022. As of June 2023, the count reached 6,021. In Thailand, several educational institutions have established their own repositories, leading to an overall increase. However, only 19 institutions have registered with OpenDOAR (JISC, 2023).

Institutional repositories face various challenges such as usability, data dissemination, infrastructure, technical skills, awareness, and copyright concerns, all of which affect their utilization. According to a study conducted on New Zealand doctoral students, it was revealed that only 48% of them were aware of institutional repositories (Arndt, 2012). Conversely, (Melo & Sanches, 2022) highlighted a significant increase in downloads, consultations, and digital information access within the University of Lisbon Repository during the COVID-19 pandemic in 2021.

Understanding user behavior is crucial for improving institutional repositories. Factors like usage frequency, content accessibility, search methods, and user interface design affect the user experience and repository usage (Kodua-Ntim, 2021). Additionally, ease of use, content availability, accessibility speed, and supportive services play a role in repository usage (Russell & Day, 2010).

Various factors, including content diversity, resource types, interface design, search methods, user interaction, utilization of repository benefits, and service characteristics, influence the demand for institutional repository usage (Karee, 2019). These factors collectively impact repository demand.

In 2019, the Asian Institute of Technology (AIT) established a central institutional repository to store and preserve academic works, including dissertations, theses, research reports, and past examination papers. AIT users can access and download these materials by logging in with their AIT accounts. From 2019 to 2023, a total of 31,657 user interactions were recorded, averaging approximately 22 interactions per day or 5 interactions per person per year, considering the number of active students (AIT Library Data). Considering the cost of installing and maintaining the AIT IR system in relation to the daily number of users, as well as AIT's research-focused approach as a graduate-level educational institution, there is a strong need to study the use of AIT IR in the student research process, students' needs from the repository, and its impact on promoting open access and resource sharing. The following research questions address these aspects:

- RQ1: What are the students' behaviors when using AIT IR?
- RQ2: What are the students' purposes for using AIT IR?
- RQ3: How do students utilize AIT IR in their research process?
- RQ4: What are the students' needs from AIT IR?
- RQ5: How is AIT IR utilized for open access and resource sharing?

This understanding can improve the repository's functionality, benefit AIT students and other institutions, and facilitate the dissemination of AIT's research output, fostering collaborative opportunities.

## LITERATURE REVIEW

### **Institutional Repositories (IR)**

An institutional repository (IR) is a digital space within an educational institution that collects and curates intellectual property-related data, involving stakeholders such as professors, researchers, scholars, and students. The repository can be accessed both internally and externally (Tiwari & Gandotra, 2018). Institutional repositories offer numerous benefits to educational institutions, including controlling research dissemination, integrating research within the university, competing with traditional publication practices, reducing library costs, highlighting institutional research activities, and enabling widespread visibility and open access to research outputs. They also serve as long-term resource repositories, enhancing educational resources, fostering awareness, and improving visibility within the academic community (Santos-Hermosa, 2023). These repositories encompass various resources and services, such as research reports, theses, dissertations, conference proceedings, teaching materials, patents, and digital media like images, videos, and research data (Adaeze, 2020). Additionally, they preserve essential documents for academic purposes, including examinations, work documents, and instructional materials (Plutchak & Moore, 2017). DSpace, E-print, and Digital Commons are popular software options for institutional repositories, with other solutions like CDSware, Fedora, and Diva also being used (Tiwari & Gandotra, 2018). Institutional repositories can be classified into disciplinary repositories focused on specific academic disciplines, institutional or university repositories managed by the institutions themselves to showcase their research output, and national or regional repositories maintained by governmental bodies or groups of institutions, facilitating access to research outputs from multiple institutions within a country or region (Kodua-Ntim, 2021).

Institutional repositories are crucial in higher education for preserving and sharing research, fostering collaboration, improving research quality and accessibility, and enhancing institution visibility and reputation (Adaeze, 2020). They focus on disseminating electronic theses and dissertations, promoting academic communication, and providing easy access to research resources (Rasuli et al., 2023). The number of repositories worldwide has steadily increased since 2005, reaching 6,041 as of June 2023, while Thailand currently has only 19 registered repositories (JISC, 2023). Among Thai higher education institutions, 95 out of 174 have developed repositories managed by Libraries and Research Institutions, predominantly utilizing the DSpace software. These repositories are known by various names, such as Institutional Repositories, Intellectual Repositories, Knowledge Repositories, Research Databases, and Electronic Theses and Dissertations Databases (May 29, 2023).

### **Institutional Repository Usage Behavior**

Factors influencing institutional repository usage are diverse and supported by various studies. Users discover repositories through library staff, institution websites, and researcher communication, including recommendations from peers or professors (Gohain & Angadi, 2019). Their objectives for utilizing these repositories are to support teaching, research, increase visibility, and facilitate communication of their research output to others. (Akparobore & Omosekejimi, 2020; Kodua-Ntim, 2021). Users trust repositories as valuable academic resources that contribute to research quality (Gohain & Angadi, 2019; Sembiring, 2020). Users prioritize easy and fast access to academic publications, freely obtaining content from both external and internal sources. (Adaeze, 2020; Kakai & Musoke, 2018). Repositories play a crucial role in the research process, aiding in needs analysis, motivation, decision-making, and content creation. (Ikeda & Inoue, 2008). Users typically favor academic articles, research work, theses, dissertations, and conference proceedings (Gohain & Angadi, 2019). Effective search methods involving author names, keywords, and subject titles are preferred, necessitating user-friendly interfaces and efficient metadata management (Mahasuk, 2017; Nwachi &

Idoko Dr, 2021). Institutional repositories encompass various functions, including submission, metadata application, access control, discovery support, open access, distribution, and preservation (Nneka & Kaosisochukwu, 2021).

### User Needs of Institutional Repositories

User needs in institutional repositories encompass a variety of factors. Firstly, repositories should offer a diverse range of resources, including articles, theses, dissertations, conference papers, and more (JISC, 2023). Secondly, ease of access is crucial, but challenges such as network instability, large datasets, broken links, and language barriers need to be addressed (Gohain & Angadi, 2019; Mondoux & Shiri, 2009). Thirdly, reliable and up-to-date content is essential for users to trust the research works available (Marsh, 2015). Access to full-text documents should be promoted, as most users prefer freely available content (Arnepalli et al., n.d.). Supporting citation and referencing through tools like download counts and metadata standards is highly important (Khan et al., 2022). Collaborative knowledge sharing features, such as data analysis and communication tools, are crucial for effective knowledge management (Zhao et al., 2020). Integration with other research tools and systems, including data repositories and institutional information systems, facilitates data sharing and usage (Russell & Day, 2010; Scherer et al., 2020). Individual notification features, enabled by technological advancements, such as mobile applications and SMS technology, can enhance user experience (Paul Anbu & Mavuso, 2012). Clear recommendations on copyright compliance and user support and training are significant factors, with guidelines needed to ensure proper data depositing, management, and usage, and additional training required for staff and students (Kodua-Ntim, 2021; Saliu et al., 2022; Ukwoma & Ngulube, 2019).

### Research Conceptual Framework

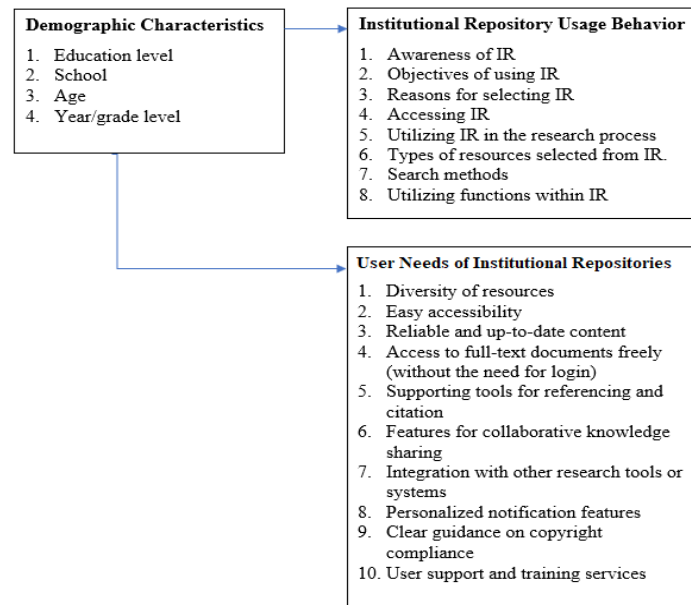


Fig. 1. Conceptual Framework

### RESEARCH METHODOLOGY

This study examines student behaviors and needs regarding the institutional repository at the Asian Institute of Technology. The sample consists of 1,109 enrolled students from different schools: the School of Engineering and Technology (505), the Schools of Environment, Resources, and

Development (350), and the School of Management (252) (Data as of May 23, 2023). An online questionnaire was created using Google Forms and distributed via email to the entire sample group for data collection. The response period spanned 15 days, specifically from May 27, 2023, to June 10, 2023. This timeframe was strategically chosen to conduct a preliminary pilot phase, coinciding with the graduation period and the imminent semester break. Our primary intention was to gain valuable insights into the user behavior and needs of students who have prior experience with the AIT Institutional Repository, including those who were scheduled to graduate during this semester. The survey was conducted from May 27, 2023, to June 10, 2023., resulting in 233 responses (21.01 %). The collected questionnaire responses were analyzed and processed statistically. Descriptive statistics, such as frequency and percentage, were utilized to analyze personal information and user behavior concerning the AIT Institutional Repository (IR). In addition, the mean and standard deviation were used to assess the needs of students in relation to the repository.

## RESEARCH FINDINGS

According to the survey results, the majority of respondents were master's degree students, accounting for 156 individuals, representing 66.95% of the total participants. Among them, 104 students (44.64%) were enrolled in the School of Environmental, Resources, and Development. Additionally, 154 respondents (66.09%) were 30 years old or younger, with a significant portion being second-year students, comprising 136 individuals (58.37%).

Based on the study on user behavior in utilizing AIT IR, it was found that the primary sources of awareness for AIT IR services were the Library Website (72.96%), Library Orientation Program (46.35%), and Friend's recommendation (28.33%), with 170 individuals, 108 individuals, and 66 individuals respectively. The main objectives of the users were to explore research and find relevant academic resources (85.84%), access and download full-text theses, dissertations, and other student research materials (55.36%), and conduct literature searches and systematic reviews (51.93%). The key reasons for accessing information from IR more than other sources were the easy and convenient access to full-text research materials (70.82%), the ability to browse by field of study (50.64%), and the freedom from paywalls or subscription fees (49.79%). The majority of users preferred retrieving information from IR within the institution (50.64%), while 103 individuals (44.21%) preferred both on-campus and off-campus access, and only 12 individuals (5.15%) preferred off-campus access only. Furthermore, a significant number of students, 176 individuals (75.54%), utilized IR during their literature review process, 144 individuals (61.80%) for research methodology, and 139 individuals (59.66%) when searching for a research topic. Theses were the most frequently used materials (78.97%), followed by dissertations (46.35%) and research reports (45.06%). The most popular search method was browsing by title (66.52%), followed by browsing by subject (54.08%) and browsing by school (47.21%). Many users, 185 individuals (79.40%), downloaded full-text documents, 175 individuals (76.82%) viewed research materials online, and 68 individuals (29.18%) saved items to their personal collection or favorites (Table 1).

AIT students have expressed significant needs for various aspects of AIT IR, as evidenced by their ratings. Firstly, they highly value up-to-date content, with a mean score of 4.11, emphasizing the importance of accessing the most current information. Additionally, the ease of accessing research or data with just a few clicks is crucial, as reflected by a mean score of 4.03. AIT students also have a strong desire for additional research materials, including datasets, articles, patents, and algorithms, which received a mean score of 4.02. The availability of supporting tools for citation and referencing, such as Mendeley and Endnote, is highly sought after, attaining a mean score of 3.98. Furthermore, AIT students prioritize open access to full-text documents without requiring login, evident by the mean score

of 3.89. They also emphasize the need for clear guidance on complying with copyright policies, as well as user support and training services, both scoring a mean of 3.88. Personalized subject alerts are seen as a valuable feature, with a mean score of 3.73. Collaborative knowledge sharing functionalities, such as adding comments and suggestions, rating, and favoriting, also hold importance to AIT students, scoring a mean of 3.71. AIT students additionally value the ability for authors to deposit research data, achieving a mean score of 3.71. Lastly, there is a moderate demand for allowing external users to access and download materials, indicated by a mean score of 3.34. These ratings provide valuable insights into the specific areas of interest and requirements expressed by AIT students regarding the features and services offered by AIT IR (Table 2).

**Table 1. User behavior in using ait institutional repository (top 3 results)**

<b>1. How did you become aware of AIT Institutional Repository services?</b>	<b>Frequency</b>	<b>Percentage</b>
Library Web site	170	72.96
Library Orientation Program	108	46.35
Friends	66	28.33
<b>2. What are your purposes for using the AIT institutional repository?</b>	<b>Frequency</b>	<b>Percentage</b>
Exploring research and finding relevant resources for academic purposes	200	85.84
Accessing and downloading full-text theses, dissertations, and another student research types	129	55.36
Conducting literature searches and systematic reviews	121	51.93
<b>3. What are the reasons you prefer using the AIT institutional repository for finding research materials compared to other sources (i.e., Google, other university databases, online databases)?</b>	<b>Frequency</b>	<b>Percentage</b>
Easy and convenient access to full-text research materials	165	70.82
Ability to browse by field of study	118	50.64
Freely accessible without paywalls or subscription fees	116	49.79
<b>4. Where do you typically access the AIT institutional repository from?</b>	<b>Frequency</b>	<b>Percentage</b>
On-campus	118	50.64
Both on-campus and off-campus	103	44.21
Off-campus	12	5.15
<b>5. At which stage of the research process do you typically use the AIT institutional repository?</b>	<b>Frequency</b>	<b>Percentage</b>
Literature review	176	75.54
Research methodology	144	61.80
Finding a research topic	139	59.66
<b>6. What types of materials from the AIT institutional repository do you typically use?</b>	<b>Frequency</b>	<b>Percentage</b>
Thesis	184	78.97
Dissertation	108	46.35
Research Report	105	45.06

<b>7. What methods do you typically use for searching within the AIT institutional repository?</b>	<b>Frequency</b>	<b>Percentage</b>
Browsing by Title	155	66.52
Browsing by Subject	133	57.08
Browsing by School	110	47.21
<b>8. What actions do you typically perform when using the functions available in the AIT institutional repository?</b>	<b>Frequency</b>	<b>Percentage</b>
Download full text documents	185	79.40
View research materials online	179	76.82
Save items to a personal collection or favorites	68	29.18

**Table 2. User needs level in utilizing ait institutional repository**

<b>User Needs in Using the AIT IR</b>	<b>Mean</b>	<b>S.D.</b>	<b>Level of Needs</b>
1. Access research or data with just a few clicks	4.03	.90	High needed
2. Additional research material (i.e., datasets, articles, patents, algorithm)	4.02	.88	High needed
3. Up-to-date contents	4.11	.93	High needed
4. Open access to full-text documents (no login required)	3.89	1.04	High needed
5. Allow external users to access and download	3.34	1.15	Medium
6. Feature for collaborative knowledge sharing (i.e., add comment and suggestion, rating, favorite)	3.71	.96	High needed
7. Supporting tools for citation and referencing (i.e., Mendeley, Endnote)	3.98	.96	High needed
8. Feature for personalized subject alerts	3.73	.97	High needed
9. Clear guidance on complying with copyright policies.	3.88	.96	High needed
10. Allow author to deposit research data	3.71	.96	High needed
11. User support and training services.	3.88	.93	High needed

Based on feedback from 102 students' suggestions and comments, we identified five priority areas: positive feedback (20.59%), up-to-date materials (20.59%), supplementary materials (18.63%), improved access and search (10.78%), and website design/display (7.84%). These insights will guide enhancements to enhance students' experience with the Institutional Repository.

## DISCUSSION

The research findings align with previous studies that have examined user needs and behaviors in institutional repositories. Studies by Gohain & Angadi (2019), Akparobore & Omoisejimi (2020), and Kodua-Ntim (2021) have highlighted the significance of user feedback and the diverse factors that influence institutional repository usage. These studies also emphasize the role of repositories in supporting teaching, research, and increasing the visibility of research output.

The findings regarding the preference for accessing the AIT IR through the Library Website are consistent with the study by Sembiring (2020), which emphasizes the importance of user-friendly interfaces and efficient metadata management in repositories. Similarly, the emphasis on up-to-date content and the demand for supplementary materials, such as journals and article papers, aligns with the findings of Adaeze (2020) and Kakai & Musoke (2018), who emphasize the need for repositories to provide easy and speedy access to academic publications.

The importance of user support and training identified in the current study resonates with the findings of Supamas Mahasuk (2017), which highlight the need for comprehensive user support services in repositories. The desire for personalized alerts and collaborative features corresponds to the study by Ikeda & Inoue (2008), which emphasizes the role of repositories in aiding needs analysis, motivation, decision-making, and the creation of research outputs.

The findings also shed light on the broader impact of the AIT IR beyond AIT students. The demand for open access to full-text documents aligns with the growing movement for open science and the benefits it brings to the wider research community. The ability to deposit research data, as desired by the students, aligns with the principles of data sharing and collaborative research advocated by Nwachi & Idoko Dr (2021).

Overall, these findings highlight the significance of user feedback, various factors influencing repository usage, and the role of repositories in supporting teaching, research, and increasing research visibility. The findings also show consistency with studies emphasizing the importance of user-friendly interfaces, efficient metadata management, up-to-date content, supplementary materials, user support, personalized alerts, collaborative features, and the depositing of research data. Additionally, the findings reflect the broader impact of the institutional repository in promoting open access to full-text documents and supporting the principles of data sharing and collaborative research. In summary, these findings provide strong evidence that the research indeed explores the utilization of the Institute Repository and sheds light on its implications for the academic and research community.

## **CONCLUSION**

The research findings reveal that AIT students exhibit diverse and significant needs in relation to the AIT Institutional Repository (IR). The majority of respondents were master's degree students, primarily from the School of Environmental, Resources, and Development. These students actively utilize the AIT IR, particularly during their literature review process. The preferred access point to the IR was through the Library Website, highlighting its importance as a central hub for research materials.

The study identified several key needs expressed by AIT students. They emphasized the importance of having up-to-date content readily available in the IR, enabling them to access the latest research and resources. Additionally, students placed high value on easy access to research materials and expressed a demand for supplementary resources to enhance their academic endeavors. Tools for citation and referencing were deemed essential, and students greatly appreciated the open access availability of full-text documents.

Clear guidance on copyright policies and robust user support services were identified as crucial factors for enhancing the user experience with the AIT IR. Furthermore, students expressed interest in personalized alerts to stay updated on relevant research in their specific areas of interest. They also highlighted the importance of collaborative knowledge sharing, such as the ability to add comments, suggestions, ratings, and favoriting, within the IR platform. The ability for authors to deposit their research data was another desired feature, promoting data-driven research and collaboration among AIT students.

While there was moderate demand for external access to the AIT IR, the findings underscore the diverse needs and expectations of AIT students in relation to the functionalities of the repository. In summary, the research findings provide valuable insights that can guide future improvements and enhancements to the AIT IR, ensuring its effectiveness in supporting the research and academic activities of AIT students. By addressing these needs, the AIT IR can serve as a valuable resource not



only for AIT students but also for other academic communities, fostering research, collaboration, and knowledge dissemination across disciplines and institutions.

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# Developing Special Programs of Public Libraries with Cooperative Organizations: Case of Yonghak Library in South Korea

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## ABSTRACT

Public libraries today should strive to manage various cultural and educational programs within the limited personnel and financial constraints. In this situation, cooperation with other regional organizations can be a useful alternative. This study analyzes the special programs of public libraries developed and operated through cooperative projects with various regional organizations outside the library by the Yonghak Public Library in Daegu, South Korea. It includes the programs operated by Education in Our Village, Ji Beom Village Broadcasting, and other cooperative organizations. To investigate the characteristics and situations of the major programs, we interviewed the program managers, analyzed the data in-depth, and suggested some ideas to utilize the various regional cooperative groups.

**Keywords:** Public library, Library cooperation, Special programs

## INTRODUCTION

Public libraries play an important role in providing cultural and educational services to the local community. Currently, public libraries are facing shrinking budgets while also finding themselves having to compete with other similar service institutions for a limited user base (Oh, 2008). In this rapidly changing and resource-constrained environment, public libraries need to explore innovative strategies to offer diverse programs. Therefore, public libraries must develop and provide special programs to meet the diverse demands and interests of library users in an ever-changing environment. One effective approach must be to establish a cooperative system with local organizations to surmount the challenges posed by limited personnel and financial resources. The purpose of this study is to examine the development and operation of special programs by Yonghak Public Library in South Korea through cooperation with other local community organizations.

Public libraries should be operated with public funding from the government or local authorities. Adequate funding is essential for maintaining, managing, and staffing public libraries, as well as for acquiring and maintaining book collections. Therefore, securing stable financial resources is directly linked to the success or failure of library operations. The majority of funding for public libraries comes from the government and local authorities, making them susceptible to the policies and economic changes of their parent institution. As a result, public libraries face challenges in securing stable financial resources (Song, 2010). To expand services and encourage community participation, public libraries strive to cooperate with external organizations through cooperative programs. These efforts can result in providing library users with diverse and enhanced services.

External cooperative organizations encompass a wide range of entities, including local non-profit organizations, educational institutions, government agencies, cultural organizations, and businesses. By

leveraging the resources, expertise, and networks of these organizations, public libraries can effectively meet the needs of their users by tapping into new resources. Furthermore, through cooperation with external cooperative partner organizations, public libraries can access diverse expertise and resources that they may not have internally. This partnership allows public libraries to harness the strengths and knowledge of external organizations, fostering innovation and creating a resilient library ecosystem capable of adapting to any situation. Additionally, cooperative relationships facilitate the development and provision of special programs that go beyond the traditional scope of library services, providing library users with a broad range of cultural and educational opportunities.

This study will suggest how public libraries can expand their provision of enhanced programs through cooperation with external partner organizations, through the analysis of the case of Yonghak Public Library. Additionally, the special programs proposed in this study aim to provide insights and assistance to other public libraries facing similar challenges in developing innovative programs through cooperative efforts. By exploring cooperative programs with external organizations such as “Library Beyond the Library”, “Our Village Education Sharing Promotion Committee”, and “Jibeom Village Broadcasting”, the public library should seize the opportunity to establish itself as a local platform that consistently meets the changing demands and aspirations of library users through collective endeavors.

## UTILIZATION OF EXTERNAL COOPERATIVE ORGANIZATIONS IN YONGHAK LIBRARY

There have been many studies on the cooperation between public libraries (e.g. Nam et al., 2008), as well as between public libraries and other types of libraries. Related to the utilization of external resources and cooperation in public libraries, Oh (2003) examines specifically how public libraries in the Los Angeles area utilize human resources. It analyzes the activities and utilization of ‘Friends of the Library groups, volunteers, and library foundations through on-site visits, interviews with stakeholders, and the analysis of various materials and websites. However, there is a lack of research on the utilization of external cooperative organizations by public libraries.

Yonghak Public Library has cooperated with other local organizations based on a Memorandum of Understanding (MOU) to develop and implement special programs. This approach helps overcome the limitations of the library’s internal human resources and budget constraints while strengthening the relationship with residents. It also serves as a way to go beyond the limitations of existing cultural programs and overcome the challenges faced by the library. The followings are representative cooperative special programs between Yonghak Public Library and external organizations in the local community.

**Table 1. Major special cooperation programs of Yonghak library**

Programs		Cooperative Organizations	The beginning year	Num. of Participants (2022)
Main	Sub			
Library Beyond the Library	Meeting Suseong Seonbi	Cheongho Seowon, Bongsan Seowon, Ocheon Seowon Chunghyo Jae, Haksan Jae and 6 other organizations	2021	427 people (17 times)
	Immersed in Cultural Heritage	Nat. Daegu Museum, Cheongho Seowon		288 people (20 times)

	Field Experience Camp for Family Ecology at Jinbatgol, a Place for Inner Growth	Jinbatgol Campground		444 people (37 times)
	Muhak Forest Ecological Experience	Yeongnam Forest Academy Cooperative		1,154 people (79 times)
	Time for Contemplation: Mindfulness Walking	Jinbatgol Campground		120 people (15 times)
	Let's Play, Shincheion!	Daegu Environmental Education Center		42 people (9 times)
Our Village Education Sharing Promotion Committee	Our Village Book Sharing Festival	Bumul 1-dong, Bumul 2-dong, Jisan 1-dong, Jisan 2-dong, Sang-dong,	2016	About 3,000 people
	Our Village Children's poem Festa	Hwanggeum 1-dong Our Village Education Sharing Promotion Committee.	2017	66 participants, About 100 Audience
Jibeom Village Broadcasting	Mom's Talks. Magpie News, Let's Play in the Playground	Jibeom Village Broadcasting	2022	7 people
Total				5,648 people (180 times)

### 1. “Library Beyond the Library” Program

The “Library Beyond the Library” program aims to transform the entire local community into an educational platform by discovering local educational resources and fostering the development of global citizens who can quickly respond to the rapidly changing future society. This program is designed and implemented in cooperation with local institutions and organizations to explore and utilize educational and cultural resources and to respond swiftly to future changes. Librarians set up various thematic areas and cooperate with local organizations to operate the program. The following six programs are typical ones of this type.

#### 1) Meeting Suseong Seonbi Program

The ‘Meeting Suseong Seonbi’ program is based on the theme of Gye-dong Gyeong-chang, Jeon, a prominent figure in the Daegu Toegye School and the originator of the Seonbi (meaning scholars or learned persons in Korea) spirit. It offers experiential programs at Seowon (Confucian Academy) and

<sup>1</sup> Seonbi: A term in Confucianism referring to a person who possesses both knowledge and integrity. Seonbi embodies the Confucian ideals and can refer to individuals or a social class that embodies the Confucian ideology. Seonbi cultivates their own character through academic pursuits, refine their scholarly knowledge, and express their will and beliefs through official positions. During the Joseon Dynasty, when Confucianism became the state ideology, Seonbi held positions of leadership in society and took on the social responsibility of guiding and enlightening the public by exemplifying Confucian moral norms. In modern times, the term can be understood as denoting an ideological leader or intellectual that society demands. (Korean Ethnic and Cultural Encyclopedia, <https://encykorea.aks.ac.kr>)

other local cultural heritage sites. The program aims to actively utilize local cultural heritage and establish local identity.

2) *Immersed in Cultural Heritage Program*

It is a cooperative program with the National Daegu Museum, a comprehensive cultural institution dedicated to the systematic preservation, research, exhibition, and education of cultural heritage in Daegu and Gyeongsangbuk-do province. It is the only museum specializing in traditional costumes in Korea and serves as a central history museum for Daegu and Gyeongsangbuk-do. Visitors can enjoy diverse and engaging exhibitions throughout the year. Additionally, the museum provides various educational programs tailored to different generations and demographics to enhance museum education.

3) *Field Experience Camp for Family Ecology at Jinbatgol, a Place for Inner Growth.*

It is a program utilizing a nearby Forest Park in our Suseong-gu county named Jinbatgol, a tranquil urban oasis where visitors can immerse themselves in scenic valleys and leisurely walks. The park also features a forest bathing facility. In cooperation with Jinbatgol Campground, a local campsite, an ecological experience camp was organized to offer residents an opportunity to explore the serene ambiance of Jinbatgol and discover the aesthetics of self-control. The camp aimed to foster self-reflection and establish humanistic values through forest and ecological humanities experiences.

4) *Muhak Forest Ecological Experience Program*

It is a program in our branch of Forest Library named Muhak, located in the Forest Park. It included various ecological experience programs using the Forest. Additionally, in cooperation with the local cooperative organization named Yeongnam Forest Academy Cooperative, they have developed distinctive programs specifically tailored to Muhak Forest.

5) *Time for Contemplation: Mindfulness Walking Program*

‘Time for Contemplation: Mindfulness Walking’ program has provided the residents of our county with an opportunity to engage in contemplation while walking along the picturesque trail in the area, in cooperation with Jinbatgol Campground. It aims to help participants rediscover vitality in life and reflect on their inner selves.

6) *Let’s Play, Shincheon! Program*

It is a program by another branch named Padong Library, located very close to the Shincheon stream (a local stream going through our Daegu City). To stimulate the children’s interest in the local natural environment, the library cooperated with the Daegu Environmental Education Center to provide information about various plants and animals that inhabit Shincheon, just in front of the library.

**2. Our Village Education Sharing Promotion Committee**

In Daegu Metropolitan City, the ‘Our Village Education Sharing Promotion Committee’ is being implemented to help young people restore a sense of community through their relationships with the local community, not just limited to schools. Through various experiential activities and new experiences, they can find happiness and pursue their dreams. The committee focuses on community activities through the ‘Our Village Education Sharing Promotion Committee’ to enhance the protection and development of youth in the community. Their objectives include spreading educational and sharing culture, promoting communication among residents and youth through the recovery of community bonds, providing opportunities for career exploration and vocational experiences in various fields, alleviating educational disparities, and sharing caregiving responsibilities. The committee organizes diverse programs to achieve these goals.

Respective four administrative districts neighboring Yonghak Library have managed their own ‘Our Village Education Sharing Promotion Committees’. Each committee supports the educational efforts and future aspirations of young people in their respective neighborhoods. Public libraries play

an educational role by providing free access to information through a wide range of books and materials, promoting literacy, supporting lifelong learning, and encouraging community participation. Even now, public libraries develop and provide various programs to educate and promote local culture to the residents. As a result, public libraries serve as educational and social hubs, fulfilling the educational, social, cultural, and recreational needs of the community. That's why Yonghak Library cooperates with the 'Our Village Education Sharing Promotion Committee' to provide programs for the residents. The following two programs are typical ones.

#### *1) Our Village Book Sharing Festival Program*

Since 2016, excluding the COVID-19 pandemic in 2020, Yonghak Library has hosted a local festival called "Our Village Book Sharing Festival" for seven consecutive years. The festival aims to strengthen the role of the library as an integral part of the local educational community and provide opportunities for the residents to participate in community activities. Through cooperation with relevant local organizations and groups, a variety of programs are conducted. The festival serves as a multifunctional space, combining elements of culture, education, leisure, and more, building upon the existing functions of the library. It aims to fulfill the diverse cultural needs of the residents, foster community connections through encounters and relaxation, and serve as a dynamic cultural hub (Shin & Noh, 2020).

#### *2) Our Village Children's Poem Festa Program*

From 2017 until October 2022, except during the COVID-19 pandemic season, Yonghak Library has hosted a children's poem festival called "Our Village Children's Poem Festa" for 6 years. Initially beginning as the "Children's Poem Recitation Competition" in 2021, it was renamed the 'Children's Poem Festa' and continued in the form of a festival. The "Children's Poem Festival" promoted local reading culture, specifically for children. The festival provides a platform for the residents to communicate through poetry and aims to strengthen community bonds through cooperation with local organizations.

### **3. Jibeom Village Broadcasting Program**

"Jibeom Village Broadcasting" is a voluntary organization composed of residents from the villages named Jisan and Beommul areas in the county. Its goal is to enhance the quality of life for the residents by focusing on education, culture, and leisure within the community. The membership structure is based on the "Our Village Education Sharing Committee" in the areas, with the residents participating voluntarily. The following is the organizational structure of "Jibeom Village Broadcasting."

"Jibeom Village Broadcasting", established in 2022, conducted the 1<sup>st</sup> season of radio production education from July to September. After joining Daegu Village Broadcasting Network to promote cooperation with other village broadcasting organizations, they launched a YouTube channel for Jibeom Village Broadcasting, featuring content such as "Moms's Talks," "Magpie Magpie News," and "Let's Play in the Playground." They also participated in the Daegu Village Broadcasting Open Relay Talk Show called "Visible Radio." In 2023, they are recruiting members for the 2<sup>nd</sup> season to further enhance the organization's growth, both in quantity and quality.

### **4. Other Cooperative Organizations Programs**

In addition to the special programs above, Yonghak Library has cooperated with diverse organizations to offer more various programs. The following are examples of cooperative programs conducted with different organizations, most of which are one-time events: Tongcheong Academy Lecture (Humanities lecture), Experience the healing of the 500-year-old Joseon Royal court, Digital Learning Center: Lecture for Smartphone utilization, Let's play in English (Lecture), "The Library is Alive" (community-engagement volunteer program), "Grandmother and Four Animals" (dementia-themed puppet show),



Cultural “Feel” Forum (Various cultural and artistic events), Special lecture for the national history including trip program, etc. Further details about these programs can be found on the library’s website.

## **SUGGESTIONS FOR THE LIBRARY TO COOPERATE WITH OTHER EXTERNAL ORGANIZATIONS**

We have analyzed the special programs conducted in cooperation with external organizations at Yonghak Library in Daegu, based on the library's publications, reports, informal data from program managers, and interviews with the concerned of the cooperating organizations.

Not only Yonghak Library but also many public libraries in Korea have developed and maintained various special programs with external organizations. However, they are faced with challenges in maintaining relationships with outside cooperating organizations, developing new programs, and finding new partners. The following recommendations suggested based on the experience of Yonghak Library can be helpful for those libraries.

Firstly, it is essential to find out the local external organizations willing to cooperate with the library, including non-profit organizations, educational institutions, government agencies, cultural organizations, and businesses, because each organization has its unique resources, expertise, and networks. The library should explore relevant organizations, analyze their potential for cooperation, and assess their alignment with the library’s goals and ideals. Before finalizing mutually beneficial partnerships, it is important to assess whether the selected candidate’s external organizations align with the goals and ideals of the library.

Secondly, it is important to establish clear co-objectives between the involved parties before developing cooperative programs, and to determine the issues or needs the library trying to address and identify the specific type of programs required to achieve those goals.

Thirdly, it is necessary to build a partnership with the selected organization, by exploring various ways to establish a mutually beneficial relationship with the cooperating organization. It includes joint program development, resource sharing, information exchange, promotion, and marketing, based on a mutual understanding of the areas of interest with the cooperating organization by clarifying goals, values, and expectations between the library and the cooperating organization. It is essential to document these elements clearly and formally.

Fourthly, it should be allocated the resources and roles for the cooperative program between the library and the cooperating organization, include specifying the division of tasks, financial arrangements, and program operations. It encompasses not only financial and personnel resources but also the sharing of duties and responsibilities. Detailed resource allocation should aim to maximize the utilization of available resources for both the library and the cooperating organization. For instance, the library can provide the venue and facilities, while the cooperating organization can contribute instructors or experts. Additionally, the library and the cooperating organization can consider sharing the budget required for the cooperative program. It is also advisable to document the details of the cooperation, similar to a Memorandum of Understanding (MOU), to ensure clarity and alignment between the parties involved.

Fifthly, all the cooperative special programs should be planned and operated in cooperation between the library and the cooperating organization from the outset, including developing detailed plans for program objectives, content, schedule, participant recruitment, and execution. Both parties should maintain a close relationship to ensure the smooth progress of the cooperative programs based on good communication between the parties involved.

Sixthly, the outcomes of the cooperative programs should be regularly evaluated quantitatively and qualitatively for future improvement and strategy development. Participants' feedback information

gathered before and after the program can be helpful for comparative analysis that can identify the strengths and weaknesses of the program.

Seventhly, there should be efforts to maintain sustained cooperation to cultivate and enhance the relationship between both parties, in addition to the cooperative programs, such as regular meetings and information sharing to share and promote the achievements and values of the cooperative programs.

Lastly, it would be desirable to conduct related research on some of the successful cooperative programs between the libraries and partnering organizations which can be best practices and make them publicly available to and shared with others planning to or operating similar cooperative models. Those results can be shared through related associations or conferences to facilitate the exchange of experiences, and the acquisition of new ideas through networking with other professionals.

## CONCLUSION

According to the Library Law in Korea, a public library is defined as a library established and operated for public information utilization, reading activities, cultural activities, and lifelong education. Public libraries include public municipal libraries operated by the state or local governments and education superintendents, as well as private-public libraries operated by corporations, organizations, or individuals. A local community refers to a living space where social interactions among the residents occur, shared culture exists, and a sense of community is fostered. Therefore, a public library should cooperate with various local institutions and organizations and plan library services that engage residents from diverse backgrounds, to faithfully fulfill its role within the local community. Furthermore, public libraries should continually consider how to provide the desired knowledge and information to users and determine the role they should play as public spaces within the local community.

The term ‘platform’ initially brought to mind a train station where people embark and disembark from trains. It also referred to a stage or podium used by instructors or conductors. Now, its meaning has expanded to encompass the foundation or framework that constitutes a specific device or system, and it is widely used in various fields. A platform evolves through the connection and interaction of participants and is regarded as an ecosystem of mutual benefits, offering new value to everyone involved. A library, especially a public library, serves as a kind of platform - a multifaceted cultural space for sharing information, knowledge, and cultural content with the local community (Kim, 2021). In this sense, cooperative programs developed and managed by local community organizations can play important roles in shaping the library as a platform. In addition, libraries need to leverage the existing platform and engage in innovative and creative planning to meet the demands of the times and enhance their competitiveness.

Cooperation with local organizations can also play an important role in achieving ongoing innovation and development in libraries. By engaging in cooperation, libraries can leverage external resources to share expertise, and experiences, and gain new ideas and approaches. Additionally, cooperation with various organizations helps expand networks, allowing libraries to provide diverse programs and services. Through cooperation, libraries strengthen their connection with the community and foster mutual benefits. Furthermore, libraries enhance diversity, and inclusivity, and stimulate innovation and creativity by utilizing richer external resources. Cooperation with local organizations assists in addressing the challenge of limited resources, strengthening the sustainability of libraries, and optimizing budget utilization. In this regard, libraries can establish mutually beneficial partnerships through cooperation with local organizations, promoting positive interactions with the community, and realizing sustainable development and social value.

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# The Phenomenon of Independent Bookstores in Korea and Its Implications

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## ABSTRACT

This study investigates the phenomenon of independent bookstores in Korea and derives implications for libraries. It explores the concept, origin, type, and growth mechanism of Korean independent bookstores, and provides suggestions for libraries based on these findings. The first suggestion is to prioritize the selection of books that align with user demands to increase the relevance of the collection, similar to independent bookstores. The second suggestion is to activate reading groups where individuals from diverse backgrounds can interact. Setting themes for reading groups and accepting individual applications can increase satisfaction.

**Keywords:** Independent bookstore, Library, Reading culture space, Curation, Book club

## INTRODUCTION

Currently, there is a decline in the usage of public libraries by the younger generations, specifically those in their 20s and 30s, referred to here as the “2023 generation.” Despite the highest awareness and past usage rates among those in their 20s, the major usage rate is at its lowest, and it tends to increase with age (Seoul Metropolitan Library, 2018). However, it cannot be inferred that they have no interest in the culture of reading. This is demonstrated by the fact that, from 2015 to 2021, the rate of book reading among adults from 19 to over 60 years was inversely proportional to age (Ministry of Culture, Sports and Tourism, 2021).

It seems that the 2030 generation, who display a strong interest in reading culture and have a higher reading rate than other age groups, prefer engaging with reading culture more at general and large bookstores and independent bookstores, rather than at public libraries. When examining the customer demographics at general and large bookstores, the 2030 generation comprises 51% while at independent bookstores, they make up 79% (Trendis, 2019).

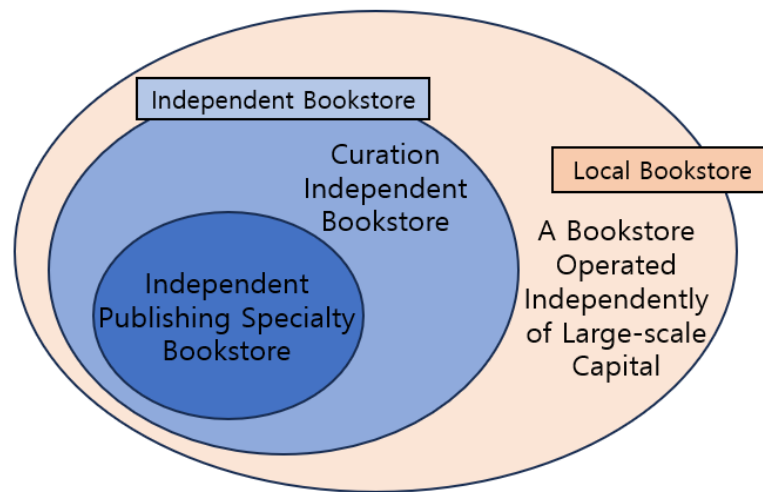
Therefore, researchers believe it is meaningful to investigate the concept, origin, types, and development of Korean independent bookstores, which are gaining attention as a space for the reading culture of the 2030 generation. This study will provide a better understanding of the implications for libraries.

## THE CONCEPT AND ORIGIN OF INDEPENDENT BOOKSTORES IN KOREA

In Korea, bookstores are divided into online and offline stores. Offline stores are further classified based on their operators into large bookstores run by large-scale capital, and local bookstores independently

operated by individuals separate from large-scale capital. However, in recent times, independent bookstores have emerged as a new form of distinct form separate from local bookstores.

It may seem natural to define an independent bookstore as a bookstore operated independently of large-scale capital. However, in Korea, bookstores operated independently of large-scale capital are classified as local bookstores. This classification is based on publishing-related laws established by the government. Consequently, while independent bookstores in Korea fall under the category of local bookstores that operate independently of large-scale capital, they cannot be defined in the same manner as local bookstores. This is because the bookstores referred to as independent bookstores in Korea possess distinct differences from local bookstores. Based on this concept and definition, the relationship between independent bookstores and local bookstores can be represented as shown in Figure 1.



**Fig. 1. The Concept and Current Status of Independent Bookstores in Korea**

The concept of independent bookstores in Korea has evolved over generations. First-generation independent bookstores served as venues where authors could directly distribute their independently published works. On the other hand, second-generation independent bookstores emerged as stores that primarily focused on handling independent publications (Gu & Jang, 2018a). Third-generation independent bookstores can be characterized as curated bookstores, offering not only independently published books but also mainstream publications that have been selectively curated by bookstore operators. Therefore, the current third-generation independent bookstores in Korea can be defined as those where all books available are introduced through the curation of the bookstore operators.

#### **TYPES AND DEVELOPMENT PROCESS OF INDEPENDENT BOOKSTORES IN KOREA**

According to a study, independent bookstores in Korea can be classified into four types based on the books they handle and their activities (Gu & Jang, 2018b).

- Type 1: Bookstores that deal with independent publications.
- Type 2: Curated bookstores that sell selectively chosen books.
- Type 3: Multi-purpose bookstores that operate in conjunction with other industries.
- Type 4: Community bookstores that are centered around various programs.

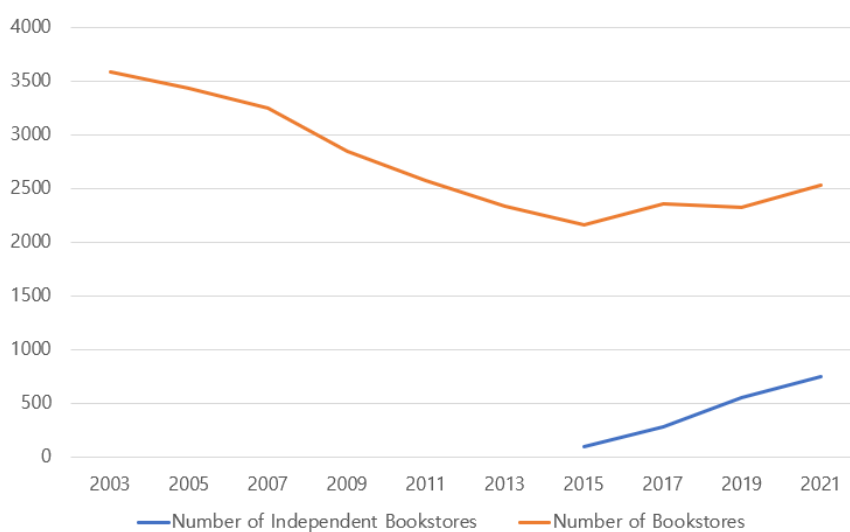
There are limitations to categorizing all independent bookstores in Korea into specific types. While many independent bookstores operate as curated bookstores, selling selectively chosen books,

they often engage in other business activities such as selling beverages to generate additional revenue. Furthermore, they may utilize support programs provided by public institutions or implement their self-developed programs. These factors present challenges in categorizing all independent bookstores into distinct types.

Independent bookstores can be categorized based on whether they primarily deal with independent publications or mainstream books. However, the nature of independent bookstores is always subject to change. The composition of books can naturally vary depending on the curating aspect, as it is a dependent variable influenced by the curation process (Kang & Kim, 2023). Since independent bookstores emphasize the value of diversity and each store has its distinct characteristics, more case studies with a larger sample size are needed to classify Korean independent bookstores into different types.

The development process of independent bookstores in Korea is closely intertwined with the growth of independent publishing. In 2000, the magazine 'Sinclairs' was created, often referred to as the first independent publication in Korea. Following 'Sinclairs,' various forms of independent publishing from the mid-2000s, including 'independent magazines,' 'small-scale publishing,' and 'self-publishing.' These forms deviated from conventional production, distribution, and sales methods and instead adopted unique approaches (Eun, 2016). Subsequently, in 2008, independent publications began to be featured in a designated corner of the bookstores called 'Ieum Bookstore,' and 'The Books,' a specialized bookstore for independent publications, was established. In 2009, additional independent bookstores like 'Your Mind' came into existence (Eun, 2016).

In this manner, independent bookstores began to emerge and gradually expanded up to the present day. The number of bookstores in Korea decreased from 3,589 in 2003 to 2,320 in 2019. However, as of December 2021, there was an increase of 208 bookstores compared to December 2019, indicating a shift in the trend of declining bookstore numbers. One of the external factors contributing to this change can be attributed to the growth of independent bookstores (Korea Federation of Bookstore Association, 2022). The number of independent bookstores in Korea has steadily increased from 97 in 2015 to 815 in 2022, showing consistent growth without any annual decline. Figure 2 presents a graph illustrating the changes in the number of bookstores and independent bookstores in Korea (Korea Federation of Bookstore Association, Dongneseojeom Inc., 2023).



**Fig. 2. Changes in the Number of Bookstores in Korea and the Number of Independent Bookstores in Korea**

## **IMPLICATIONS OF INDEPENDENT BOOKSTORE ACTIVITIES IN KOREA**

### **Books Curated to User Demands**

The curation approach of independent bookstores differs from that of libraries. In libraries, resources are curated around specific themes, to enhance the utility of books, and are presented in separate collections or exhibitions (Baek, 2018). While libraries follow this approach to book curation, independent bookstores have a distinguishing feature: all the books they handle undergo curation through a selection process carried out by bookstore curators. Through proactive curation on specific themes, independent bookstores strive to increase the relevance of books, tailoring them to meet the demands of their users.

The advantage of curating all books handled by independent bookstore operators is that they know the reasons behind each book's curation. This enables them to provide users with more detailed information about the books and also allows them to stock books that align with the specific themes of the independent bookstore. While independent bookstores may have limitations in covering all topics, this is mitigated by the division of labor and collaboration among independent bookstores specializing in different fields.

Such activities of independent bookstores highlight the need for libraries to be more proactive in curating books that align with user demands, thus enhancing the relevance of books to meet user needs.

### **A Space for Interaction and Communication**

Programs in public libraries often follow a format that includes inviting guest speakers or experts. This approach aims to attract a large number of participants by inviting a single speaker who can engage a broad audience, resulting in programs with high levels of participation. However, book clubs have struggled to appeal to the 2030 generation, despite being a long-standing program in most public libraries since their early establishment. According to a study conducted in 2004, it was found that there were no book clubs specifically targeting college students, and book clubs focused on working professionals accounted for only 8 out of the total book clubs, representing 2.2% (Kim, 2005). Nevertheless, book clubs play an important role in public libraries as they provide a platform for diverse individuals to interact and engage in conversations, fostering opportunities for dialogues and interaction among people from different backgrounds.

Independent bookstores often adopt a format similar to book clubs. However, what sets them apart from traditional public library book clubs is that when individuals sign up, the independent bookstore operators match them with people from diverse age groups and backgrounds who share common interests. In this way, independent bookstores provide opportunities and spaces for diverse individuals to come together and communicate. The 2030 generation, who have common interests but also seek encounters and interactions with people from different environments, find great satisfaction in this type of book club format.

In this regard, public libraries are encouraged to actively promote book clubs as spaces for interaction and communication among people from diverse backgrounds. Instead of accepting applications from pre-existing close-knit groups, it would be more effective to establish themed book clubs and invite individual participants who are interested in those specific themes.

## **CONCLUSION**

The purpose of this study was to explore the concept, origins, types, and developmental processes of independent bookstores in South Korea. These bookstores have gained attention as cultural spaces for the reading culture of the 2030 generation. The study also aimed to derive implications from the perspective of libraries.

In Korea, local bookstores are defined as bookstores operated independently from large-scale capital. While independent bookstores in Korea fall under the category of local bookstores that are independently operated, they cannot be defined in the same way as local bookstores. The distinction lies in the fact that bookstores referred to as independent bookstores in Korea are categorized based on whether all the books they handle have been curated.

Categorizing all independent bookstores in Korea into specific types has its limitations. The majority of independent bookstores operate as curated bookstores, selling selectively chosen books. Many of them also engage in other businesses, such as selling beverages to generate revenue. They make use of support programs from public institutions or develop their programs. Given the emphasis on diversity and the distinct characteristics of each independent bookstore, more case studies with a larger sample size are needed to classify Korean independent bookstores into types.

The development of independent bookstores in Korea is closely related to independent publishing. Independent publications began to emerge in the mid-2000s, and bookstores focusing on independent publications started to appear in 2008. These independent bookstores have grown steadily and emerged as a notable factor in reversing the declining trend of the number of bookstores from 2003 to 2019. In 2021, there was an increase of 208 bookstores in 2021 compared to 2019.

Based on the implications derived from the activities of independent bookstores in Korea, two suggestions are proposed for libraries. Firstly, it is suggested that libraries be more proactive in curating books that meet user demands, with a focus on increasing the relevance of books that aligned with user preferences. Secondly, libraries are encouraged to further activate book clubs as spaces for interactions and communication among people from diverse backgrounds. Instead of accepting applications from pre-existing close-knit groups, it would be more effective to establish themes for book clubs and invite individual participants who are interested in those specific themes. This approach has the potential to enhance the satisfaction of the 2030 generation by providing opportunities for encounters and interactions with individuals who share similar interests but come from different environments.

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# **Future Skills for Information Professionals in a Digital Age: A Study of the Skills and Competencies Required for Librarians and Information Specialists to Succeed in a Digital Environment**

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## **ABSTRACT**

This study aims to identify the future skills and competencies required for information professionals to succeed in a digital environment. Specifically, the researchers intend to discover the vital digital competencies and skills that information professionals need to develop to achieve in a digital environment and how they differ from traditional competencies and skills. This study will reveal how information professionals acquire digital skills and competencies and the best training and educational programs available to support their development. More so, this research will also examine how libraries and other organizations support the development of digital competencies and skills among their information professionals and the best practices for creating a culture of continuous learning and skill development in the digital age. The findings of the study will help the library association and library information science (LIS) organization plan the appropriate continuous professional development program for information professionals. A descriptive research design, particularly quantitative methods, was employed in the study. The participants will be randomly selected and must meet the criteria set forth by the researchers.

**Keywords:** Digital skills, Digital competencies, Digital age, Information professionals

## **INTRODUCTION**

In today's digital age, information professionals face new challenges as they strive to keep up with the rapidly changing technology landscape (Bawden & Robinson, 2016). The digital age has brought forth several trends that significantly impact information professionals. These include the increasing reliance on digital platforms and tools for information management, the growing importance of data analytics and data-driven decision-making, the rise of artificial intelligence and automation, and the evolving nature of information dissemination through social media and online platforms. With the increasing reliance on digital tools and electronic resources, the traditional responsibilities of these professionals have expanded significantly, including managing digital collections, providing digital services, and facilitating access to information through a range of digital platforms (Alemneh & Provost, 2018). Alongside these trends, information professionals face various challenges and issues. These include the

need to adapt to rapidly changing technologies, ensuring the ethical and responsible use of data, addressing information security and privacy concerns, and bridging the digital divide to ensure equitable access to information resources. As a result, information professionals need to develop new skills and competencies to remain effective and relevant in their roles (Cox & Jantti, 2017). The digital age also presents numerous opportunities for information professionals. These include leveraging emerging technologies such as machine learning and natural language processing to enhance information retrieval and analysis, harnessing the power of big data for strategic decision-making, embracing digital collaboration tools to foster global knowledge sharing, and capitalizing on the digital transformation of libraries and information centers to provide innovative services. This study aims to identify the future skills and competencies required for information professionals to succeed in a digital environment. By understanding these skills and competencies, libraries and other organizations can better support the ongoing professional development of their information professionals, ensuring they have the necessary tools and knowledge to provide high-quality services in the digital age (Bawden & Robinson, 2016).

## **LITERATURE REVIEW**

The function of librarians and information professionals continuously evolves as we move into the digital age. Information professionals must develop essential skills and competencies to thrive in this new context. The Professional Regulatory Board for Librarians (PRBFL) developed and formulated the National Competency-Based Standard for Filipino Librarians (NCBSFL), which identifies technology competencies as one of the core competencies needed by librarians to contribute to the effectiveness of the operation of the organization (PRBFL Resolution No 3 series of 2015).

In the study of Widen & Krongvist-Berg (2014), IT skills, research management skills, pedagogical skills, communication and marketing skills, collection management skills, and project management skills are the six core skills expected from future librarians. These skills were also revealed in the study of Yadav (2022) that traditional library skills, research skills, computing skills, data management skills, and soft skills have been classified as five significant categories of knowledge, skills, and abilities of LIS professionals in the digital age. This study found that LIS practitioners need computing skills, library automation, library digitalization, and soft skills, which are also crucial for LIS professionals. On the other hand, special libraries require technical, liaison, and foreign language skills.

More so, fundamental knowledge of librarianship, communication skills, leadership and management, collection development, information literacy, research, and IT skills are the attributes of the 21<sup>st</sup> century librarians (CARL, 2010). It is expected that librarians of the 21<sup>st</sup> century will be technologically proficient. They are supposed to succeed in the digital environment and must actively participate in exploring and deploying new technologies in their respective libraries. A mixture of professional knowledge, general abilities, and personal competence is required of information specialists in a digital focus library environment. Consequently, in a digital library environment, traditional librarianship core knowledge and skills must be supplemented with new technical skills (Choi & Rasmussen, 2009, as cited in Rqju, 2014).

Librarians are tested with their skills and competencies during the pandemic, where everything is digital. However, most librarians need more digital skills to provide library services during the pandemic. Pereira (2022) recommended that librarians attend various seminars and short-term courses to further their self-education to assist them in developing the required skills. Furthermore, to address the ever-increasing demands of library users, libraries must hire professional librarians to provide new services involving the development and dissemination of knowledge in a digital environment (Hamad, Al-Fadel, & Fakhouri, 2020).

### Research Questions:

1. How may librarians' and information professionals' key digital competencies and skills be described?
2. How will the activities and techniques for developing and acquiring digital skills and competencies among librarians and information professionals be described?
3. How will the strategies for supporting digital competencies and skills development among information professionals be described?

### METHODOLOGY

The research design, participants, instrumentation, data collection, statistical analysis of the data, and ethical considerations are all presented in this section.

#### Research Design

The study is a descriptive research design focusing on a quantitative approach. This would involve collecting data from a survey.

The first stage of the research design would involve conducting a literature review of existing research on the skills and competencies required for information professionals in a digital age. This would help identify key themes and concepts and any gaps in the literature that the study could address.

Next, a survey would be developed and administered to information professionals in various types of libraries (academic, public, special, and more) to collect quantitative data on the perceived importance of various digital competencies and skills. The survey could be distributed through professional organizations and social media platforms to reach a diverse range of respondents.

The survey will be analyzed to identify the vital future skills and competencies for information professionals in a digital age.

#### Participants

Fifty (54) registered librarians who are active members of the Philippine Librarians Association, Inc. (PLAI) took part in the survey (Table 1).

#### Instrumentation

The study used a researcher-made questionnaire as the primary data-gathering tool. The questionnaire consists of three parts. Part 1 collected information about the key digital competencies and skills of librarians and information professionals. Part 2 gathered data on the activities and techniques to develop and acquire digital skills and competencies. Part 3 obtained information on the strategies that information organizations can employ to support the librarians and information professionals.

**Table 1. Respondent's demographic profile**

<b>Regional Councils</b>	<b>N</b>	<b>%</b>	<b>Ranking</b>
National Capital Region (NCR)	<b>10</b>	<b>19</b>	<b>2</b>
Region I (Ilocos Region)	2	4	5 - 7
Region II (Cagayan Valley)	4	6	4
Region III (Central Luzon)	25	46	1

Region IVA (CALABARZON)	2	4	5 - 7
Region V (Bicol Region)	1	2	8 - 11
Region VI (Western Visayas)	2	4	5 - 7
Region VII (Central Visayas)	-	-	
Region VIII (Eastern Visayas)	5	9	3
Region IX (Zamboanga Peninsula)	-	-	
Region X (Northern Mindanao)	-	-	
Region XI (Davao Region)	-	-	
Region XII (SOCCKSARGEN)	1	2	8 - 11
Region XIII (Caraga)	-	-	
Cordillera Administrative Region (CAR)	-	-	
Bangsamoro Autonomous Region in Muslim Mindanao (BARMM)	1	2	8 - 11
Negros Island Region (NIR)	1	2	8 - 11

#### *Validation of the Research Instrument*

Two experts were asked to assess the researcher-made questionnaire as part of the face validation process, which was used to validate the questionnaire. The two experts who validated the questionnaire are a librarian/researcher and a researcher/educator. Validators' suggestions were considered to improve the questionnaire. The Cronbach alpha was computed using JAMOVI to assess the questionnaire's internal consistency and reliability after it had undergone pilot testing and been finished. The calculated Cronbach alpha is 0.968, which is good, as seen in Figure 1.

	Cronbach's a	Verbal Interpretation
Scale	0.968	Good

**Fig. 1. Scale Reliability Test using JAMOVI**

#### **Data Collection**

The questionnaire was converted into Google form and shared in the Facebook Group Chat of PLAI and its regional councils. The online survey link was also emailed to all the active members of the Association. One month period has been allotted for the data collection.

#### **Data Analysis**

Data gathered were analyzed and interpreted using descriptive statistics, primarily frequency distribution, percentage, mean, and standard deviation.

#### *Norms for interpretation*

To properly interpret the results of the computation on the level of agreement, the following norms for interpretation were utilized.

Range Interval	Descriptive Rating/Interpretation
4.21 - 5.00	Strongly Agree
3.41 - 4.20	Agree
2.61 - 3.40	Neither
1.81 - 2.60	Disagree
1 - 1.80	Strongly disagree

### Ethical Considerations

Researchers adhere to ethical guidelines and standards to ensure the integrity and validity of the studies. Confidentiality and privacy of participants' personal information and data are safeguarded, and steps are taken to anonymize data to prevent identification. Researchers strive to minimize harm to participants, both physical and psychological, and maintain research integrity through honest and transparent practices. Coercion is avoided, ensuring voluntary participation and free from undue influence. Researchers disclose any conflicts of interest and obtain ethical review and approval from relevant bodies before conducting the research. By adhering to these ethical considerations, researchers uphold the principles of integrity, respect, and responsible conduct in the study.

### RESULTS

This section presents the findings of the study presented on tables.

Table 2 indicates a strong consensus that digital competencies and skills, including data analysis, information security, content management, user experience design, information retrieval, and digital literacy, are crucial for information professionals in the digital age. It emphasizes the need for continuous learning and the prioritization of digital competencies in training and education.

**Table 2. Librarians and information professionals' key digital competencies and skills**

Indicators	Mean	SD	Verbal Interpretation
1. Digital competencies and skills are crucial for information professionals	4.69	0.58	Strongly Agree
2. Digital competencies and skills are different from traditional competencies and skills	4.61	0.68	Strongly Agree
3. Data analysis and interpretation skills	4.69	0.58	Strongly Agree
4. Information professionals should have knowledge of information security and privacy practices in the digital age.	4.80	0.41	Strongly Agree
5. Proficiency in digital content management is essential for information professionals today.	4.74	0.44	Strongly Agree
6. User experience design skills are critical for information professionals working in a digital environment.	4.61	0.53	Strongly Agree

7. Information professionals should be skilled in information retrieval and advanced search techniques in the digital age.	4.74	0.44	Strongly Agree
8. Digital literacy and information fluency are fundamental competencies for information professionals.	4.78	0.42	Strongly Agree
9. The development of digital competencies should be a priority in the training and education of information professionals.	4.63	0.52	Strongly Agree
10. Information professionals should continuously update their skills to keep pace with digital advancements.	4.80	0.41	Strongly Agree
<b>General Weighted Average</b>	<b>4.62</b>	<b>0.78</b>	<b>Strongly Agree</b>

Table 3 presents various activities, strategies, and techniques librarians and information professionals employ to enhance their digital skills and competencies. It highlights the diverse approaches taken, such as enrolling in online courses and e-learning, participating in on-the-job training and practical experience, attending conferences and workshops, networking and collaborating with peers, engaging in mentorship programs, accessing high-quality training programs, self-paced online learning, acquiring professional certifications, collaborating with IT professionals, and volunteering for short-term digital projects. This comprehensive overview illustrates the multifaceted nature of skill development and showcases the proactive efforts made by professionals in the field to stay updated and proficient in the digital realm.

**Table 3. Development and acquisition of digital competencies and skills for librarians and information professionals**

<b>Indicators</b>	<b>Mean</b>	<b>SD</b>	<b>Verbal Interpretation</b>
1. Enrolling in online courses and e-learning	4.48	0.57	Strongly Agree
2. Participating in on-the-job training and practical experience	4.54	0.64	Strongly Agree
3. Attending conferences and workshops	4.61	0.49	Strongly Agree
4. Networking and collaborating with peers and participating in professional communities	4.63	0.49	Strongly Agree
5. Involving in mentorship program	4.61	0.53	Strongly Agree
6. Accessing to high-quality training and educational programs	4.59	0.53	Strongly Agree
7. Engaging in self-paced online learning	4.52	0.50	Strongly Agree
8. Acquiring professional certifications	4.61	0.56	Strongly Agree
9. Collaborating with IT professionals	4.69	0.47	Strongly Agree
10. Volunteering to short-term digital projects	4.52	0.57	Strongly Agree
<b>General Weighted Average</b>	<b>4.58</b>	<b>0.54</b>	<b>Strongly Agree</b>

Table 4 highlights various activities, approaches, and techniques that libraries and other organizations can employ to facilitate the growth and enhancement of digital competencies among their

information professionals. Recognizing the importance of digital skills in the evolving information landscape are strategies encompass a range of initiatives, including providing access to digital training resources and online learning platforms, encouraging participation in workshops and conferences, offering mentorship programs, allocating dedicated time for continuous learning, providing financial support for training programs, recognizing and rewarding engagement in skill development, fostering collaborative environments, incorporating skill assessments into performance evaluations, and cultivating a culture that values and promotes lifelong learning. These strategies serve as a comprehensive guide for organizations seeking to support the digital competency development of their information professionals.

**Table 4. Strategies for supporting the development of digital competencies and skills among information professionals**

<b>Indicators</b>	<b>Mean</b>	<b>SD</b>	<b>Verbal Interpretation</b>
1. Support the development of digital competencies for professionals.	4.72	0.45	Strongly Agree
2. Provide access to digital training resources and online learning platform.	4.76	0.43	Strongly Agree
3. Encourage information professionals to attend digital skills workshops and conferences.	4.78	0.42	Strongly Agree
4. Offer mentorship programs with experienced digital professionals.	4.72	0.45	Strongly Agree
5. Allocate time for information professionals to engage in continuous learning activities.	4.74	0.44	Strongly Agree
6. Provide financial support to pursue digital skills training program.	4.76	0.47	Strongly Agree
7. Recognize and rewards who actively engages in digital skill development.	4.65	0.52	Strongly Agree
8. Foster a collaborative environment that encourages knowledge sharing.	4.76	0.43	Strongly Agree
9. Incorporate digital skill assessment in performance evaluations to improve the skills.	4.65	0.55	Strongly Agree
10. Establish a culture that values and promotes continuous learning.	4.72	0.49	Strongly Agree
<b>General Weighted Average</b>	<b>4.73</b>	<b>0.47</b>	<b>Strongly Agree</b>

## DISCUSSION AND RECOMMENDATION

In an ever-evolving digital landscape, librarians and information specialists encounter challenges and opportunities within their profession. This study aims is to delve into the essential skills and competencies needed for librarians and information specialists to thrive in a digital environment. By gaining a deeper understanding of the evolving role and demands of the profession, organizations can strategically develop training programs and professional development opportunities to equip their staff with the necessary skills and knowledge.

The results in Tables 2, 3, and 4 indicate strong agreement among librarians and information professionals regarding the importance of digital competencies and skills in the digital environment. Table 2 reveals that the respondents highly recognize the significance of digital competencies, including



data analysis, information security, digital content management, user experience design, information retrieval, and digital literacy. These competencies are perceived as essential for success in the profession.

Table 3 showcases the various activities and strategies librarians and information professionals employ to enhance their digital skills. The respondents strongly agree with approaches such as enrolling in online courses, participating in on-the-job training, attending conferences and workshops, networking with peers, engaging in mentorship programs, accessing high-quality training programs, and volunteering for digital projects. These initiatives demonstrate their proactive efforts to stay updated and proficient digitally.

Table 4 highlights strategies organizations can adopt to support the development of digital competencies among their information professionals. The respondents strongly agree that organizations should support digital competency development by providing access to training resources, encouraging participation in workshops and conferences, offering mentorship programs, allocating dedicated time for continuous learning, providing financial support for training, and fostering a culture of lifelong learning. These strategies aim to create an environment that values and promotes the growth of digital skills.

The results affirm the consensus among librarians and information professionals regarding the significance of digital competencies in their profession. The findings provide valuable insights for organizations and institutions seeking to prioritize the development of digital skills among their information professionals, ultimately equipping them with the necessary knowledge and capabilities to thrive in the digital environment.

Based on the findings of the study on the skills and competencies required for librarians and information specialists to succeed in a digital environment, it is recommended that organizations should design and implement professional development programs that focus on developing digital skills among librarians and information specialists. These programs should cover data analysis, information security, digital content management, user experience design, information retrieval, and digital literacy. By providing targeted training in these areas, organizations can ensure their staff possesses the necessary skills to navigate the digital landscape effectively. Additionally, organizations should encourage librarians and information specialists to actively participate in professional communities, conferences, and workshops related to digital skills. These platforms offer valuable opportunities for collaboration, knowledge sharing, and staying updated on emerging trends and best practices. By engaging in these activities, librarians and information specialists can expand their knowledge and gain insights from their peers, ultimately enhancing their digital competencies.

Furthermore, establishing mentorship programs can significantly support the development of digital competencies among librarians and information specialists. Experienced digital professionals can serve as mentors to guide and support less experienced individuals in enhancing their digital skills. Mentors can offer valuable guidance, share practical insights, and help navigate the complexities of the digital landscape. By fostering mentorship relationships, organizations can facilitate the transfer of knowledge and expertise, ultimately strengthening the digital capabilities of their staff. Organizations may consider incorporating digital skill assessment into performance evaluations to emphasize the importance of digital competencies. This practice can serve as a feedback mechanism, providing librarians and information specialists with insights into their strengths and areas for further development. It also encourages continuous learning and improvement, ensuring individuals stay updated with evolving digital advancements. In addition, administrators should foster a culture within organizations that value and promotes continuous learning and professional growth. Encouraging librarians and information specialists to dedicate time to staying updated on digital advancements, exploring new technologies, and engaging in self-directed learning is essential. By providing support and resources for continuous learning, organizations can enable their staff to adapt to the evolving

digital landscape effectively. Lastly, collaboration and knowledge sharing between librarians, information specialists, and IT professionals within the organization should be encouraged. This collaboration can enhance the integration of digital tools and technologies into library services and foster a more comprehensive understanding of digital systems and infrastructure. By working together, different expertise can be combined to leverage the potential of digital technologies in enhancing library services.

These recommendations aim to equip librarians and information specialists with the necessary skills and competencies to navigate the digital environment successfully. In this manner, organizations can ensure that each information professional is well-prepared to meet the challenges and leverage the opportunities presented by the digital age.

## CONCLUSION

In conclusion, this study has provided compelling evidence that librarians and information professionals universally recognize the importance of digital competencies in the digital environment. The findings highlight the significance of skills such as data analysis, information security, digital content management, user experience design, information retrieval, and digital literacy for professional success.

Moreover, the study reveals that librarians and information professionals actively pursue various activities and strategies to enhance their digital skills. Their proactive approach is demonstrated through enrolling in online courses, participating in on-the-job training, attending conferences and workshops, networking with peers, engaging in mentorship programs, accessing high-quality training programs, and volunteering for digital projects. These initiatives reflect their dedication to continuous learning and staying up-to-date in the digital domain.

The recommendations presented in this study aim to empower librarians and information specialists with the necessary skills and competencies to navigate the digital environment successfully.

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# Exploring the Level of Effectiveness of the University of the East Virtual Library: Addressing the Academic Needs in an Online Learning Environment

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## ABSTRACT

The study's main objective is to determine the effectiveness of the University of the East virtual library initiative in addressing the academic needs of students in an online learning setup. In doing so, the researchers explored the effectiveness of the virtual library initiatives in terms of services, resources, and programs for students. Librarians were also consulted to determine these initiatives. The study employed a mixed method to incorporate qualitative and quantitative data. Respondents are composed of two clusters: 1) librarians who were part of the conceptualization, planning, and implementation of the digital library initiatives, and 2) 100 college respondents were selected using purposive sampling. Two instruments were administered in two different methods, including an open-ended questionnaire for focus group discussion and a survey questionnaire disseminated using Google Forms. Critical findings of this study revealed that the library planned, implemented, and evaluated the virtual library services, resources, and programs to address the academic needs of the students in the new learning modality. This result correlates as well with the findings in the survey. Online library resources have the highest level of effectiveness as they support the student's academic needs during online learning.

**Keywords:** Digital library, Online learning environment, Online library services, Online resources

## INTRODUCTION

Libraries are the foundation of every educational institution and play a vital role in enhancing the student's learning experience. The library's role is also to support the student's academic needs in whatever learning modality. In today's information age, information is ubiquitous and can be accessed easily through technology. Libraries must stay relevant and continuously adapt to the never-ending

change in the information landscape. Libraries must embrace new trends, practices, and innovations to stay relevant.

The University of the East Library always keeps discovering new ideas and reinventing its services and operation to serve the community better. The library strengthens its online services, resources, and programs to support the online learning modality of the university. More so, the library conceptualizes, plans, implements, and evaluates the online services, resources, and programs it offers to deliver quality and effective service to its stakeholders.

## **Research Questions**

The study aims to determine the effectiveness of the University of the East (UE) virtual library in addressing the academic needs of UE students during online learning. Specifically, it answers the following questions:

1. What are the online initiatives of UE Library in terms of the following:
  - a. Services
  - b. Resources
  - c. Programs
2. How do librarians address the academic needs of the students in an online learning environment in terms of:
  - a. Services
  - b. Resources
  - c. Programs
3. How do students perceive the level of effectiveness of the virtual library in terms of:
  - a. Services
  - b. Resources
  - c. Programs
4. What are the challenges encountered by the:
  - a. Students in access the virtual library?
  - b. Librarians in delivering the virtual library?
5. Based on the result, what interventions can be recommended?

## **LITERATURE REVIEW**

During the pandemic, schools and universities adopted the online learning modality. A new learning environment is essential to enhance education (Nair, 2001). The libraries shifted to the new modality to stay relevant and connected to the university's stakeholders. Library users can access the digital content of the libraries (Bajpai & Sharma, 2017), and libraries across the globe launched contactless services and made their resources accessible online (SCUTL, 2020; TUL, 2020). Libraries redesigned their web pages, widened their online resources, and created services and programs for their users. The university portal and other social media tools were used as communication tools for online learning (Rafiq et al., 2021).

According to Cherry & Evans (2013), the student's academic success is correlated with using the library's electronic resources. The students who often use the library's electronic resources got a higher GPA. This study is persuasive evidence that demonstrates that the library impacts students' academic success. The success of the students continues to prove the value of the library. One study discussed that the library staff managed to increase the collaboration between the library and distance education faculty to impact and support its patrons (Nguyen & Tuamsuk, 2020).

In Brewer, Rick & Grondin's (2017) study, assessing library effectiveness is essential to all libraries, especially in today's changing environment and technological applications. The researchers stated that the effectiveness of library resources and services can be assessed to see how such technologies affect them. The high scores recorded in the domain of access to online resources (OPAC and subscribed databases) reflect how the advancement of technology has helped the library improve its services. Students stated that they were satisfied with the resource and found it helpful.

Although a virtual library is necessary and helpful for a university library, university library managers need help with numerous problems, according to Sharma & Chauhan (2019). Supporting facilities, a shortage of human resources, the number of documents offered, equipment maintenance issues, technicians required, technological skills and competencies of librarians handling the digital library, and the fundamental problem of the library itself are some of the perennial problems of librarians and libraries. In addition, the virtual library's budget and the virtual library's necessity are challenges to overcome (Perdana & Prasojo, 2019).

On the other hand, in an online learning environment, this may cause a problem for some students, as many areas of the country need internet access, and some students need digital equipment (Alabama Political Reporter, 2020). Iqbal, Tariq, & Ahmad (2021) concluded that restricted access to digital resources reduces students' understanding of technological breakthroughs in their respective fields of study.

## **METHODOLOGY**

The research design, tool, participants, data collection, statistical analysis of the data and ethical considerations are all presented in this section.

### **Research Design**

The study employed descriptive research design, mainly mixed method. Calderon (2006) defined *descriptive research* as a purposive process of gathering, analyzing, classifying, and tabulating data about prevailing conditions, practices, processes, trends, and cause-effect relationships and then making adequate and accurate interpretations about such data with or without or sometimes minimal aid of statistical methods.

### **Participants**

The study's participants are the librarians involved in the planning, implementation, and evaluation of the virtual library and 100 selected college students who had experience in accessing the virtual library.

### **Research Instrument**

The study used a semi-structured interview with open-ended questions allowing flexibility in the responses during the Focus Group Discussion (FGD). This instrument answered the online initiatives made by the libraries and the challenges encountered in support to the new learning modality of the university. On the other hand, to evaluate the level of effectiveness of the virtual library, the researchers used a self-made questionnaire as the primary data-gathering tool. The questionnaire consists of two parts: Part 1 collected information about the effectiveness of the virtual library in terms of services, resources, and programs. Part 2 gathered data on the challenges experienced by the students in accessing the virtual library.

### Validation of the Research Instrument

The questionnaire was validated using face validation process. To improve the questionnaire, validators' suggestions were considered. The Cronbach alpha was computed using JAMOVI to assess the questionnaire's internal consistency and reliability after it had undergone pilot testing and been finished. The calculated Cronbach alpha is 0.912, which is good, as seen in Figure 1.

	Cronbach's a	Verbal Interpretation
Scale	0.912	Good

**Fig. 1. Scale Reliability Test using JAMOVI**

### Data Collection

After getting approval from the Director of Libraries to conduct the study, the researchers scheduled the FGD to the librarians and used the validated open-ended questionnaire. More so, a validated questionnaire was transformed into a Google form and shared with the students through the Department of Libraries.

The respondent's answers are treated with the utmost confidentiality and treated with anonymity in the analysis and report of data.

### Data Analysis

Data gathered were analyzed and interpreted using descriptive statistics, primarily frequency distribution, percentage, mean, and standard deviation.

### Norm for interpretation

To properly interpret the results of the computation on the degree of effectiveness, the following norms for interpretation were utilized.

Scale	Range Interval	Descriptive Interpretation	
5	4.21 – 5.00	Strongly effective	Strongly Agree / Always
4	3.47 – 4.20	Effective	Agree / Often
3	2.61 – 3.40	Slightly Effective	Undecided / Sometimes
2	1.81 – 2.60	Not Effective	Disagree / Rarely
1	1.00 – 1.80	Strongly Not Effective	Strongly Disagree / Never

## RESULTS

Table 1 shows the online initiatives of the UE Library in terms of services, resources, and programs. The library started its virtual library during the pandemic, according to a librarian interviewed. The library's online services were conceptualized in response to the new learning modality adopted by the university. The online resources available in the library were enhanced to address the needs of the students during online learning. The library shifted its programs to an online modality as well.

**Table 1. Digital initiatives of UE library in an online learning environment**

Services	Resources	Programs
<ul style="list-style-type: none"><li>• Online Document Delivery</li><li>• Online Library Assistance via FB Messenger</li></ul>	<ul style="list-style-type: none"><li>• EBSCO</li><li>• E-Books</li><li>• Digitized Printed Books</li></ul>	<ul style="list-style-type: none"><li>• Library Instruction</li><li>• Database Instruction</li><li>• Thesis and Research Instruction</li></ul>

<ul style="list-style-type: none"> <li>• Turnitin Service</li> <li>• Online Inquiries (Email)</li> <li>• Virtual Library Office (VLO)</li> <li>• Online Request</li> <li>• Thesis and Research Assistance</li> </ul>	<ul style="list-style-type: none"> <li>• Audio Books</li> <li>• Open Educational Resources</li> <li>• Digital Thesis Abstract</li> <li>• E-SCRA</li> </ul>	
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**Table 2. Librarians’ initiatives to support the academic needs of the students**

<b>Services</b>	<b>Resources</b>	<b>Programs</b>
<ul style="list-style-type: none"> <li>• Maximized the use of Google Suite</li> <li>• Posted the services, resources, and programs in the social media page of the library</li> <li>• Made visible in all UE portals and website</li> <li>• Enhanced the library management system and integrated in the dashboard all the online services available</li> </ul>	<ul style="list-style-type: none"> <li>• Curated Open Education Resources to supplement the online resources</li> <li>• Acquired and subscribed to online resources such as e-books, e-journals, and e-databases</li> <li>• Reviewed the existing online resources and identified disciplines that needs to developed</li> <li>• Coordinated with the faculty regarding the references needed in their syllabi</li> </ul>	<ul style="list-style-type: none"> <li>• Utilized various video conferencing platform aside from Gmeet (i.e. Zoom, MS Teams, Voov, FB video call, etc.) to orient the students on the new virtual library</li> <li>• Shifted the traditional library program into online</li> <li>• Partnered with the various colleges and basic education department regarding the online library programs</li> <li>• Collaborated with the English and Research class for the online database instruction and online research and thesis assistance program</li> <li>• Created specialized online programs that would cater to a specific group of students</li> </ul>

Table 2 depicts the librarians’ initiatives to support the academic needs of the students. The library maximized the Google Suite and social media page to become visible and deliver online services. They also integrated the online services in the dashboard of the library management system.

The librarians curated open educational resources and acquired/subscribed to online resources to support the research and learning needs of the students. Moreover, the librarians reviewed the existing online resources and identified disciplines that must be developed and coordinated with the faculty for additional online references needed in delivering instruction.

The library developed online programs to stay connected with the students during online learning. The librarians utilized the various online video conferencing platforms to deliver the reinvented services and programs to the students. They also collaborate with different colleges and departments to strengthen students’ awareness of the virtual library. The library developed a specialized online program and services to cater to the diverse needs of the students.



**Table 3. Students perceived level of effectiveness in terms of virtual library services, resources, and programs**

<b>SERVICES</b>	<b>Mean</b>	<b>SD</b>	<b>Descriptive interpretation</b>
Online Document Delivery	3.73	0.72	Effective
Thesis and Research Assistance	3.70	0.64	Effective
Turnitin Service	3.60	0.97	Effective
Virtual Library Office (VLO)	3.64	0.52	Effective
Online Chat (via FB Page)	3.63	0.62	Effective
Asynchronous Inquiries (Email)	3.39	0.47	Slightly Effective
<b>TOTAL</b>	<b>3.61</b>	<b>0.66</b>	<b>Effective</b>
<b>RESOURCES</b>			
Digitized Printed Books	3.77	0.90	Effective
EBSCOHost	3.83	0.87	Effective
E-Books	3.84	0.98	Effective
Audio Books	3.38	0.73	Slightly Effective
Open Educational Resources (OERs)	3.83	0.99	Effective
Digital Thesis Abstract	3.76	0.52	Effective
E-SCRA (Electronic Supreme Court Reports Annotated)	3.40	0.97	Slightly Effective
<b>TOTAL</b>	<b>3.69</b>	<b>0.85</b>	<b>Effective</b>
<b>PROGRAMS</b>			
Library Instruction (Orientation)	3.62	0.62	Effective
Thesis and Research Instruction	3.69	0.82	Effective
Database Instruction	3.65	0.99	Effective
<b>TOTAL</b>	<b>3.65</b>	<b>0.81</b>	<b>Effective</b>

Table 3 depicts the perceived level of effectiveness of the virtual library in terms services, resources, and programs. The students perceived the following virtual library services to be effective online document delivery (mean = 3.73; SD = 0.47), thesis and research assistance (mean = 3.70; SD = 0.64), VLO (mean = 3.64; SD = 0.52), online chat via FB Page (mean = 3.63; SD = 0.62), and turnitin service (mean = 3.60; SD = 0.97). However, as perceived by the students, the asynchronous inquiries in the email (mean = 3.39; SD = 0.72) are slightly effective. Overall, the virtual library services of UE library are effective as perceived by the students, with a mean score of 3.61 and a standard deviation of 0.66.

Although the students identified the digital resources as effective (mean = 3.69; SD = 0.85), it has been reported that the audiobooks (mean = 3.38; SD = 0.73) and E-SCRA (mean = 3.40; SD = 0.97) are slightly effective in supporting the academic needs of the students.

All the virtual programs of the library are effective, with a mean score of 3.65 and a standard deviation of 0.81. Among the three virtual programs, the thesis and research instruction has a high mean score of 3.69 and a standard deviation of 0.82.

Overall, the students perceived that all the areas of the virtual library are effective, especially the online resources, with the highest mean score of 3.69 and a standard deviation of 0.85.

**Table 4. Reasons for the effectiveness of virtual library**

<b>The virtual library are effective because</b>	<b>F</b>	<b>%</b>	<b>Ranking</b>
1. It efficiently delivers my requests	84	8	4
2. I can immediately receive the related literature	48	5	12-13
3. I can discuss my concerns to the librarian virtually	57	6	9
4. I can receive the response of the librarian real time	55	5	10
5. The librarian/s can fully explain the answers to my queries	47	5	14
6. It helps me answer my assignments	91	9	2
7. I can retrieve related topics regarding my research	94	9	1
8. I can read the online resources anytime anywhere	87	9	3
9. I can download and access the content of the book	69	7	8
10. I can listen and understand the e-book	48	5	12-13
11. It introduces me to various online library service	76	8	6
12. It enlightens me on how to use the databases	53	5	11
13. It motivates me to finish my assignments	44	4	15
14. It gives me confidence to access the virtual services, resources, and programs of the library	81	8	5
15. It guides me in my online learning journey	72	7	7

Table 4 indicates the reasons for the effectiveness of virtual libraries. According to respondents, a virtual library is effective because they can retrieve related topics regarding their research (Rank 1). At the same time, it also helps them answer their assignments (Rank 2), and they can read the online resources anytime, anywhere (Rank 3). On the other hand, the least effective among the given factor is that the virtual library motivates them to finish their assignments (Rank 15).

**Table 5.a Challenges encountered by the students in accessing the virtual library**

<b>Services</b>	<b>F</b>	<b>%</b>	<b>Ranking</b>
Untimely delivery of requested documents	19	13	4
No available librarian to respond to my query	17	12	5
Links are not accessible	21	15	3
No proper orientation on how to use the virtual library services	48	34	1
Connectivity	36	25	2
<b>Resources</b>	<b>F</b>	<b>%</b>	<b>Ranking</b>
Only limited time to access the digital content	39	20	2
Cannot download the full-text article	51	27	1

Need to register first before I can access the full document	33	17	4
Cannot print or download the pages	32	16	5
Limited pages to access the content	37	19	3
<b>Programs</b>	<b>F</b>	<b>%</b>	<b>Ranking</b>
Not fully aware of the programs	52	33	1
Do not know how to approach the librarians regarding their library programs	37	23	2
Cannot understand the virtual library orientation	15	10	5
Limited topics are covered by the programs	33	21	3
The programs are not disseminated properly	21	13	4

Table 5.a depicts the challenges in accessing the virtual library. One of the challenges in accessing online services is the lack of proper orientation on how to use the virtual library services (F = 48; Rank 1), connectivity (F = 36; Rank 2), links are not accessible (F = 21; Rank 3), untimely delivery of requested documents (F = 19; Rank 4), and no available librarian to respond to their query (F = 17; Rank 5).

Respondents also noted that they cannot download the full-text articles (F = 51; Rank 1), limited time to access the digital content (F = 39; Rank 2), limited pages to access the content (F = 37; Rank 3), need to register first before can access the entire document (F = 33; Rank 4), and cannot print or download the pages (F = 32; Rank 5).

The challenges encountered by the respondents in terms of programs are: (1) not fully aware of the programs; (2) do not know how to approach the librarians regarding their library programs; (3) limited topics are covered by the programs; (4) programs are not disseminated properly; and (5) cannot understand the virtual library orientation.

**Table 5.b Challenges encountered by the librarians in implementing the virtual library**

<b>Challenges</b>	<b>F</b>	<b>%</b>	<b>Ranking</b>
Slow internet connection	8	26	1-2
Lack of equipment	5	16	4
Adjustment of librarians in using new technology	7	23	3
Restriction in copyright	3	9	5
Budget	8	26	1-2

Table 5.b notes the challenges the librarians encounter in implementing the virtual library. The librarians ranked the slow internet connectivity (Rank 1-2) and budget (Rank 1-2) as the main challenges they encountered in implementing the virtual library. In addition, the adjustment of librarians in using the technology (Rank 3) was also considered a challenge to the librarians. Lack of equipment (Rank 4) and restriction in copyright were also the librarian's concerns in implementing a virtual library.

## **DISCUSSION AND RECOMMENDATIONS**

The librarians are the frontline in delivering information to our stakeholders in an online learning environment. They reinvented and restructured their library operations to comply with the requirements of the online learning modality. Since online learning is related to technology, the librarians incorporated technology/software in delivering online library services. However, implementing the

virtual library is not as smooth sailing as it seems. The librarians encountered some challenges, specifically, the need for more budget and the slow internet connectivity are the primary concerns of the library in implementing the virtual library. This concern was also reflected in the study of Chioma & Obiano (2021), Zhou (2021), and Acheampong & De-Graft (2020). They both agreed that network and internet connectivity is one of the biggest obstacles in academic libraries and to library users. This challenge has caused a lot of setbacks and lapses in terms of accessing virtual library services.

The library provides various services that will address the academic needs of the UE community. Some online services are online document delivery, thesis and research assistance, turnitin service, Virtual Library Office (VLO), online chat, and asynchronous inquiries (email). The said online services were also evident in the study of Narca (2021). Moreover, the availability of online resources such as online databases (EBSCOHost), e-books, digitized printed books, audiobooks, OERs, digital thesis abstracts, and E-SCRA was identified. The library also converted its orientation, instruction, and tutorial into online modality.

It is clear from the results that the virtual library is effective in terms of resources, programs, and services. The virtual library is effective since it assist the students in retrieving related topics regarding their research, it helps in answering their assignments and the resources can be read anytime anywhere. These were proven in the study of Sasso (2016), that virtual library supports the learning and instructional requirements of the students in an online learning environment.

The top challenges that the students faced was the need for more awareness of the program due to slow internet connection encountered by the librarians and budget. The finding was supported by the claims of Cleveland (2004) that students can utilize the library with more confidence if they have more knowledge about the online services offered by the library. As a proposal, the library should conduct orientation on how to use the virtual library, mainly the services, resources, and programs, and utilize their social media platforms so that students can access and be updated on what is happening in the library. This recommendation was also reflected in the study of Miyanda (2020) that social media platforms made it easier for the libraries to connect to the clients, and students advocated the linkages of social networking sites to the library's web page to improve collaboration between stakeholders and the libraries.

To address the areas that need to be developed, the library should create marketing strategies creatively. It should use marketing tools like video presentations, infographics, and social media. Also, the library should assess the relevance of the other virtual library initiatives in supporting the academic needs of the students in an online learning environment.

## CONCLUSION

The results of this study have practical implications for delivering virtual library services to successfully support the academic needs of students in an online learning environment. The outcomes can help librarians to have proper training in delivering online services. More so, the dissemination of information to students relative to the virtual library initiatives will significantly contribute to the success of the students in addressing their academic needs in an online learning environment.

It can be concluded that there are many difficulties in implementing a virtual library. However, these difficulties should be accepted because, in this way, the library can improve.

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# Describing Deans' Meeting Minutes: A Case Study of Records-in-Contexts in Silpakorn University Archives

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## ABSTRACT

ICA-EGAD publishes Records in Contexts (RiC), which adopts the semantic triple approach for archival description. The vision is for archives to become integrated into linked open data systems, enabling cultural institutions to share and discover resources in their repositories. However, the examples of RiC provided thus far appear to be primarily focused on traditional collections and manuscripts. This paper aims to explore the applicability of RiC to Deans' Meeting Minutes as the subject of archival description.

Currently, the metadata for the minutes, including Meeting ID, Date, Topic, Sub-topic, and Keywords, is stored in XLSX format and is provided by the university archivist. Upon transforming this metadata into semantic triples, it becomes evident that RiC may not be fully suited for the minute collection. Specifically, the subtopics within each agenda cannot be adequately represented within the existing schema. Additionally, the process of completing all the required class and relation triples without a converter is extremely time-consuming. Therefore, the development of a converter would significantly alleviate this challenge. Lastly, it is crucial to establish a consistent naming system since every instance within the archival description requires a unique identifier.

**Keywords:** Archival Description, Records in Contexts, Meeting Minutes

## INTRODUCTION

Archival description plays a crucial role in facilitating the understanding and discovery of long-term preserved records. Typically, this description follows the ISAD(G) standard, which is issued by the International Council on Archives (ICA). It encompasses various aspects of the archives, such as background information, administrative history, physical appearance, and related contexts.

Since 2016, the Experts Group on Archival Description (EGAD) has introduced a new description framework called Records in Contexts (RiC). RiC has garnered significant interest from the international community of archivists as it holds the potential to foster essential cooperation among cultural institutions. The distinguishing feature of RiC is its use of semantic triples, a format that is both human-readable and machine-readable. By adopting this format, archival description can be easily shared across linked open data systems, thereby enhancing access to archival resources.

The Silpakorn University Archives currently utilizes a distinct local description schema that has been specifically designed for various types of records. These records are available in both XLSX format and a database system. In an effort to explore new approaches and practices, the implementation of RiC for Deans' meeting minutes has been initiated as an experimental project. The aim of this project is to assess the feasibility and potential benefits of adopting RiC for describing and organizing the Deans' meeting minutes within the university archives.

## LITERATURE REVIEW

### The Use of RiC

The RiC standard is designed to offer flexibility and adaptability based on specific needs and requirements. For archives currently employing the ISAD(G) standard, they can readily adopt RiC by transforming their existing metadata into the Semantic Data format (Park, 2017; Popovici, 2019). RiC can serve as a Data Reference Model, enabling the creation of prototypes for both Relational Data Models and Graph Data Models (Shin & Kim, 2019). Utilizing a graph-based description format promotes enhanced collaboration among systems compared to traditional metadata systems, facilitating data reuse (Llanes-Padrón & Pastor-Sánchez, 2017).

The RiC standard originated from the merging of the ISAD(G), ISDF, and ISAAR(CPF) metadata standards. This amalgamation enhances the provision of comprehensive contexts for archival documents by effectively illustrating the relationships between different entities (Cooper, 2017; Popovici, 2019). By combining these metadata standards, RiC offers a more robust framework for capturing and conveying the interconnectedness of various elements within archival records.

However, Reed (2017) cautions that the responsibility of archival annotations does not include providing information about an organization's operations, the purpose of documents, or details about the creators of the documents. Therefore, it is vital to prioritize document descriptions as the primary focus when creating archival annotations. This ensures that the main emphasis remains on accurately describing the documents themselves, rather than extending into broader organizational or contextual information.

Thus far, two published RiC projects have been identified. The first project involved the creation of annotations for scientific correspondence at the Dundo Museum Biology Laboratory in Portugal (Angola). This experimental implementation of RiC aimed to provide descriptions for the correspondence exchanges between the director and 11 other individuals, without relying on any conversion tools. The project spanned approximately four years to complete (Santos & Revez, 2022).

The second project was undertaken by the National Archives of France (Archives Nationales), where a converter was utilized to automatically generate RiC descriptions from EAD and EAC-CPF formats. The generation process took around 30 minutes; however, it was specifically applicable to EAD2002, with some limitations regarding identifier and date classes (Clavaud et al., 2023).

Therefore, it can be concluded that RiC is compatible with ISAD(G), but the manual generation of RiC descriptions can be a time-consuming task based on the aforementioned projects' experiences.

### Deans' Meeting Minutes

Deans' Meeting Minutes serve as a primary source of context for all official decisions pertaining to various activities. These minutes comprise crucial elements, including the date and time of the meeting, participants, scribe, location, meeting agenda, and voting outcomes. The information contained within the minutes may be recorded in diverse formats, such as paper, parchment, or digital files.

When it comes to describing the collection of Deans' Meeting Minutes, archivists face the challenge of capturing the essence of each report succinctly. Due to the inherent complexity and breadth of the collection, it is difficult to encapsulate its entirety in a concise set of words. Archivists often rely on keywords, which are generated based on their expertise, to aid in the description of the collection and facilitate its retrieval and accessibility.

### Elements in Minutes

The Regulations of the Office of the Prime Minister on Government Correspondence 1983 serves as a national template for university meeting minutes in Thailand. This is because most Thai universities

were part of the public service until 1999 when the process of university privatization commenced under government supervision. It is worth noting that these Regulations are still in effect and continue to govern the current practice of recording and documenting university meeting minutes in Thailand.

In the practice of Silpakorn University Archives, the bibliographic information for meeting minutes typically encompasses the date of the meeting, the occurrence of the meeting (e.g., regular or special meeting with meeting ID), agenda topics, and keywords that have been extracted by the archivist. The inclusion of these details aims to enhance the retrieval and accessibility of the meeting minutes within the archival collection.

During a meeting, it is common to have four typical agendas:

1. Chairperson's Notifications: This agenda involves the chairperson providing information to the attendees for their awareness. It may include updates, announcements, or other relevant matters.
2. Confirmation of Previous Meeting Minutes: This agenda item focuses on reviewing and confirming the accuracy of the minutes from the previous meeting. Attendees discuss any necessary corrections or additions before approving the minutes.
3. Informational Matters: This agenda is dedicated to presenting and discussing matters that are intended to provide information to the attendees. It could involve reports, updates, or presentations that aim to share important details or updates.
4. Deliberation Items: This agenda item involves proposing specific matters for deliberation and decision-making during the meeting. Attendees engage in discussions, debates, and decision-making processes regarding these proposed matters.

These four agendas encompass common elements found in many meetings, ensuring a structured and organized approach to conducting discussions and decision-making processes. Each agenda in a meeting may consist of several subtopics that are unrelated to each other. As a result, when describing meeting minutes, a topic-level description is recorded, including the subtopic title, to capture the succinct message that reflects the main message or subject matter.

## **METHODOLOGY**

The experiment begins by extracting entities through the analysis of content within the reports and utilizing the database system. The resulting findings are used as input for designing a basic ontology, using Protégé 5.5.0, that is specifically tailored for Deans' Meeting Minutes. It is important to note that this prototype is independent of the RiC framework and is primarily focused on local use within Silpakorn Archives.

The subsequent step involves examining the compatibility of this ontology with RiC using a mapping technique. This evaluation helps assess the degree to which the ontology aligns with RiC and determines its potential applicability within a broader archival context.

## **RESULT**

First and foremost, the designed ontology is not currently in use. It serves as a subject of experimentation where issues of consistency and compatibility are not within the scope. However, the ontology is capable of capturing all the necessary data, similar to the current database.

The analysis of the minutes and metadata in the database system is conducted to identify entities that are noteworthy. In this case, two main entities, namely Activity and Person, are reflected upon. The entity "Activity" pertains to the actions performed by individuals and may encompass references to relevant individuals involved in decision-making, grade corrections, committee appointments, and other related activities. The entity "Person" contains data such as names, surnames, titles, as well as specific information like positions, student IDs, and other relevant details.



The activity entity is a complex one, consisting of multiple triples of interconnected information. Consequently, for the purpose of this study, the decision was made to not create an activity class, but recorded as a subtopic's data property. Instead, the focus was placed on individuals mentioned in the structure and content of minutes.

The designed ontology comprises 10 primary classes (plus 2 subclasses), 16 relationships, and 10 data properties. In Table 1, the first column shows the Domain Class and its associated data property, if any. The second and third columns display the Relation and Range, respectively, which are the complement of the Domain Class. These components are adequate for capturing the current data requirements. Additionally, the ontology enables advanced queries, such as determining the frequency of a person's absences in meetings.

**Table 1. Semantic triples in the pilot ontology**

<b>Domain Class (with Data Property)</b>	<b>Relation</b>	<b>Range Class</b>
Absentee	absenteePerson absenteeRole	Person Role
AgendaCore • agendaTopic	coreAgendaOf	AgendaDetail
AgendaDetail (subclass of AgendaCore) • agendaTopic	acdMentionPerson acdNote acdResolution acdSummary subAgendaOf	Person AgendaNote AgendaResolution AgendaSummary AgendaCore
AgendaNote	acdMentionPerson srnPartOfAgendaDetail	Person AgendaDetail
AgendaResolution	acdMentionPerson srnPartOfAgendaDetail	Person AgendaDetail
AdendaSummary	acdMentionPerson srnPartOfAgendaDetail	Person AgendaDetail
Attendee	attendeePerson attendeeRole	Person Role
Minute • minuteEndTime • minuteID • minuteStartTime • minuteDate	hasAgendaDetail minuteAbsentee minuteAttendee minuteTakenBy	AgendaDetail Absentee Attendee Person
Person • personName • personLastName	hasTitle	Title
Student (subclass of Person) • studentCode	-	-
Role • roleName	-	-
Title • titleValue	-	-

The description of the meeting minutes primarily focuses on the relationship between individuals and the agenda topics within the minutes. It lacks the inclusion of other fundamental information such as the meeting place. Activities are considered part of the subtopics within the minutes and are not explicitly mentioned as separate entities in the description.

The pilot ontology does not support the historical view of data. For example, it cannot show the proper series of the academic rank with the triple, *Person* → *hasTitle* → *Title*, since it lacks the data, an appointed date.

The results of transforming the meeting minutes to RiC format have two main implications. In general, a meeting minute can be considered an instance of the *RiC-E02: Record Resource* entity. To be precise, *RiC-E03: Record Set*, which can be employed to represent a file containing the meeting minutes, while each individual minute can be described as a *RiC-E04: Record*. Furthermore, the *RiC-E12: Position* entity and *RiC-E08: Person* align with the Role and Person entities in the pilot ontology respectively, facilitating the representation of various positions or roles held by individuals within the meeting minutes. However, *RiC-E05: Record Part* is not suitable for describing meeting agendas and topics since its purpose is to capture record contexts rather than the internal elements or contents within the document.

## CONCLUSION

RiC offers the opportunity to significantly enhance access to archives by serving as an input for any linked open data system. However, for archivists to effectively utilize RiC, training is required to understand the standard and its associated query language, as there are currently no end-user tools available. Additionally, manually describing records without a converter is an extremely time-consuming task. Considering Silpakorn University's utilization of a local schema description, a dedicated converter should be developed for each form of records. Furthermore, RiC mandates to assign identifiers for every instance, underscoring the necessity for a consistent naming system.

In terms of retrieval, RiC does not provide a means to describe the content within a record, similar to the use of ISAD(G), which offers an overview of a set of records. The utilization of keyword search for Deans' Meeting Minutes appears to yield efficient results. To enhance practicality, the use of DoCO (Document Component) (Constantin et al., 2016) would provide additional contexts regarding the content of records.

This experiment demonstrates that metadata is sufficiently capable of describing minutes. By utilizing a collective set of semantic triples and leveraging the SPARQL language, a deeper understanding of the subject and its contexts can be achieved.

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