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Examining the Practice of Digital Scholarship Services at Vietnam National University Ho Chi Minh City

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ABSTRACT

The article reports the results of an investigation on the practice of providing digital scholarship services at Vietnam National University Ho Chi Minh City, Vietnam. This study is part of an ongoing research project entitled *Developing a digital scholarship service framework for universities at Vietnam National University Ho Chi Minh City.* It employed a qualitative research approach through in-depth interviews with 31 individuals who are university managers, library managers, lecturers, and postgraduate and undergraduate students from six member universities and Central Library of Vietnam National University Ho Chi Minh City. Research results show that some digital scholarship services have been provided at Vietnam National University Ho Chi Minh City. However, they have not been yet systematically implemented and have not met users' needs. Lack of needed resources such as space, technology infrastructure, human resources, finance, and stakeholder support are among major challenges in developing digital scholarship services. The management of existing digital scholarship services is fragmented without a clear policy for developing digital scholarship and supporting services. The study contributes to the existing knowledge by adding substantially to current understanding of the practice of providing digital scholarship services in Vietnam's universities in the transition period, from state control to autonomy, which has not been much addressed in previous research. Furthermore, this study can be a useful reference for higher education institutions in developing countries regarding implementation of digital scholarship services.

Keywords: digital scholarship, digital scholarship services, higher education, Vietnam

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1. INTRODUCTION

In the digital environment, higher education institutions make constant efforts to apply digital technology to academic activities, creating favorable conditions for the development of digital scholarship. In an effort to help Vietnam's universities effectively implement support activities for digital scholarship, a four-stage research project entitled *Developing a digital scholarship service (DSS) framework for universities at Vietnam National University Ho Chi Minh City (VNU-HCM)* has been conducted from 2020 to 2022. This ongoing research project towards building a model of a DSS system at VNU-HCM, one of the two key national universities in Vietnam, is expected to be one of the solutions for digital transformation at this educational institution.

This paper, as part of an ongoing research project mentioned above, presents the results of a qualitative study (Stage 2) conducted to understand the practice of providing DSSs at VNU-HCM. The study used a preliminary framework for DSSs, which was built upon completion of the first phase of the aforementioned large research project, to identify three specific research objectives as follows.

(1) Identify DSSs currently being implemented at VNU-HCM;
(2) Understand the current status of resources for the implementation of DSSs at VNU-HCM;
(3) Understand the governance of existing DSSs at VNU-HCM.

'Digital scholarship services' has become a fashionable topic in recent years and there are many studies conducted by researchers around the world. However, there is a shortage of research that addresses DSSs in the Vietnamese context, a developing country in the Far East. This study is therefore a contribution to fill the research gaps. Current DSS frameworks/models mainly concentrate on DSS groups. By investigating the practice of the DSSs provided and the conditions for their development at VNU-HCM, the work presented in this paper contributes to the construction of a future DSS framework that embraces both DSS groups and the conditions for the development of DSSs in higher education institutions.

2. CONTEXT OF THE STUDY

In recent years, the Vietnamese government has determined that digital transformation is a new driving force for economic growth and social development (Prime Minister of Vietnam, 2020). This is demonstrated through the issuance of the *National Digital Transformation Program until 2025, with a Vision up to 2030* (Prime Minister of Vietnam, 2020). Digital transformation in education, one of eight prioritized fields in the program, will focus on developing online education platforms, technologies, and resources towards individualized training. Furthermore, the Scheme on Development of Education Society in 2021-2030 (Prime Minister of Vietnam, 2021) aims to improve the quality of human resources and, by 2030, for 90% of universities to deploy digital universities.

Vietnam has two national universities: VNU-HCM and Vietnam National University Hanoi. These two universities have received big support from the government and aim to become high-quality, multi-disciplinary, and multi-field educational, scientific research, and technology-transfer world-class institutions (Politburo Standing Committee, 2000). However, the situation changes when higher education institutions have to shift from centralized management to subsidized decentralization and strengthening the autonomy of universities. Recently, on December 30, 2019, the Government promulgated Decree No. 99/2019/ND-CP detailing the Law on Higher Education (Prime Minister of Vietnam, 2019), clearly stating that higher education institutions are allowed to have autonomy on finance, property, organizational structure and personnel, academic, and professional activities. On June 21, 2021, the Government issued Decree No. 60/2021/ND-CP on financial autonomy mechanisms for task performance, organizational structure, staffing, and finance for public administrative institutions (Prime Minister of Vietnam, 2021). This means the current expenditure budget for public universities has been cut, leaving them ever more dependent on tuition money. The above documents have had a great impact on the governance activities of public universities, including VNU-HCM.

To face the National Digital Transformation Program and decrees on university autonomy, VNU-HCM has developed a strategic plan for the 2021-2025 period, with a vision up to 2030 that aims for it to become a research university among the top in Asia (Vietnam National University Ho Chi Minh City, 2021). This plan identifies six strategic groups, most of which are strongly related to digital transformation and university autonomy: (1) Improving the efficiency and effectiveness of university governance; (2) Training human resources capable of working in an international environment, leading, and bearing the identity of VNU-HCM; (3) Developing science and tech-

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nology, encouraging innovation; (4) Strengthening cooperation and proactive integration; (5) Building a smart and green campus; (6) Developing financial resources. This strategic plan has facilitated the development of digital scholarship at VNU-HCM.

VNU-HCM has a staff of 6,092 people, of which 3,532 (58%) are lecturers and researchers, and 2,560 are administrative staff (42%). VNU-HCM has a current student body of 76,000, including full-time undergraduate and postgraduate students (Vietnam National University Ho Chi Minh City, 2020). VNU-HCM's education fields span over many disciplines including natural sciences, engineering sciences, social sciences, humanities, economic sciences, and health sciences. VNU-HCM has seven member universities: University of Technology (UT), University of Science (US), University of Social Sciences and Humanities (USSH), International University (IU), University of Information Technology (UIT), University of Economics and Law (UEL), and An Giang University (AGU). Although AGU became a member university of VNU-HCM in 2019, the merger process will not be completed until the end of 2022. VNU-HCM also has several affiliated institutes, centers, and units, in which the Central Library is the affiliated unit responsible for coordinating the activities of member universities' library systems.

3. LITERATURE REVIEW

There is still no unified definition of digital scholarship up to now (Zhou et al., 2019), because it is a multi-faceted concept (Research Libraries UK, 2021) that can be defined and studied from different perspectives. University libraries therefore use varied and multi-faceted ways to support digital scholarship activities within their institutions (Greenhall, 2019). With the view that DSS is a reform of traditional library services and aims at providing user-centric research support services for universities in China, Zhou et al. (2019) proposed a DSS framework with six service groups: supporting services, formulating research ideas, locating research partners, writing proposals, conducting research, and publishing results.

Digital scholarship support is also profoundly contextual because the development and provision of DSSs depends on the needs of users and the characteristics of each university (Craft, 2018). Research by Hurrell (2019) found that the academic community at the University of Calgary had a need for space and community, access to interdisciplinary collaborators, and training/consultation on digital scholarship tools. Based on these findings, the research raised the issue of providing support corresponding to identified user needs. Therefore, contextual factors need to be considered when implementing DSSs.

According to Boyer (1990), academics need to be able to perform four functions: discovery (conducting research), integration (making connections across the disciplines), application (translating theoretical knowledge into the real world of applied situations), and teaching (designing and implementing teaching and learning activities). One of the most commonly used definitions of digital scholarship introduced by Rumsey (2011, p. 2) indicates that "digital scholarship is the use of digital evidence and method[s], digital authoring, digital publishing, digital curation and preservation, and digital use and reuse of scholarship." Based on the above perspectives, digital scholarship can be broadly understood as the application of digital tools to research, teaching, and learning activities. Accordingly, DSSs should be provided in proportion to such activities.

The practice of DSSs has been explored in many studies conducted in different contexts. In general, many university libraries around the world have provided DSSs to the academic community (Li et al., 2020). However, the level of DSSs provided by each university is different. There are universities that have built a fairly comprehensive DSS model, for example, the four-tiered DSS model of New York University (USA): (1) Tier 1 – Enterprise academic and administrative tools; (2) Tier 2 – Standard research services; (3) enhanced research services; and (4) applied research and development (Vinopal & McCormick, 2013). There are also universities that only provide a very small number of DSSs, such as universities in Nigeria (Gbaje et al., 2020) and the University of Cape Coast (Ghana) (Ocran & Afful-Arthur, 2021). The Library of Congress (USA) is another example; although this organization is considered a world leader in the management of digital collections, the library still does not have a DSS system for the whole organization. Instead, it mainly deals with requests for digital scholarship consultations from reading rooms, informal consultations with researchers, and inquiries through some other channels (Library of Congress, 2020).

Previous studies have shown that the implementation of DSSs by universities faces many challenges that need to be addressed, such as the lack of financial support for digital scholarship (Clay, 2016; Koga, 2018; Lippincott, 2017); lack of cooperation among stakeholders (Clay, 2016; Lippincott, 2017; Tzoc, 2016) as well as lack of motivation for digital scholarship due to skepticism and limited prioriti-

zation of digital scholarship by faculty members (Lippincott, 2017); limitations in technological infrastructure as well as in communication and outreach (Clay, 2016; Lippincott, 2017); lack of skills of digital scholarship support staff (Clay, 2016; Mitchem & Rice, 2017); and lack of space and equipment (Mitchem & Rice, 2017). Therefore, the implementation of the DSSs needs to consider the above factors.

There are many models of DSS governance that have been proposed, including virtual, physical center, and hybrid models (Mitchem & Rice, 2017). There is also a central model connecting to satellite branches (hub-model or hub-and-spoke), lab model, network model (Maron & Pickle, 2014), centralized services, mesh network, and consortium models (Anne et al., 2017). There is no one-size-fits-all model for managing DSSs. Each university has its own approach in supporting digital scholarship based on practical considerations.

Past literature indicates that the development of DSSs is contextual. The DSS model of each university may therefore vary depending on the needs of users and the characteristics of the institution. In order to develop DSSs, universities should identify specific services tailored to the needs of users; secure the necessary resources to implement services such as space, technological infrastructure, finance, human resources, and stakeholder engagement; and perform service governance activities. This review helps to identify the components of the theoretical framework for DSSs as presented in Fig. 1. Current DSS frameworks/models are predominantly focused on defining DSS groups, for example, the four-tiered DSS model of New York University (Vinopal & McCormick, 2013) and a DSS framework for universities in China (Zhou et al., 2019). It is suggested to build a framework of DSSs that involves both DSS groups and the conditions for the development of DSSs.

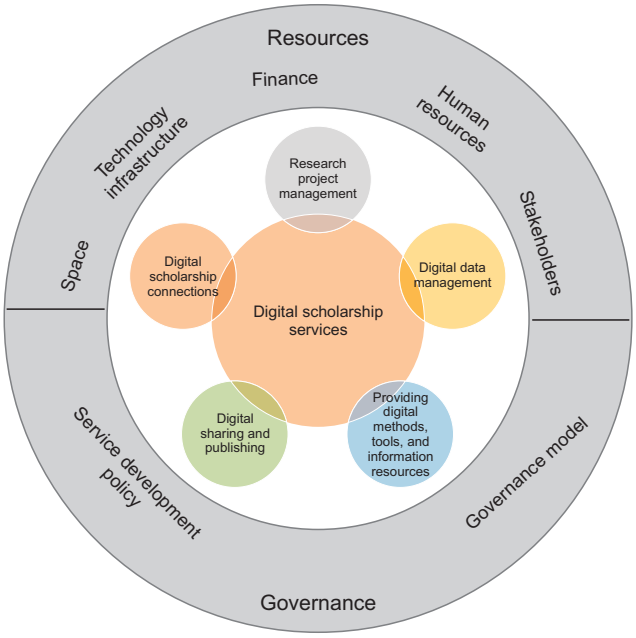


Fig. 1. Preliminary framework for digital scholarship services.

4. THEORETICAL FRAMEWORK

Stage 1 of the larger research project mentioned above proposed a preliminary framework for DSSs (Fig. 1). In this research stage, the larger research project conducted an unpublished literature review combined with analysis of the website content of a number of university libraries around the world (Nguyen et al., 2021) to identify the components of the preliminary framework for DSSs. This theoretical framework is then used to guide data collection and analysis at later stages.

The preliminary framework for DSSs consists of three main components: DSSs, the resources required to implement DSSs, and service governance.

- DSSs: drawing from the results of an investigation of selected university library websites as mentioned above (Nguyen et al., 2021), five groups of DSSs are identified based on their functions: (1) research project management, (2) digital data management, (3) providing digital methods, tools, and information resources, (4) digital sharing and publishing, and (5) digital scholarship connections.
- The resources required to implement DSSs: there are five elements to consider when implementing DSSs such as space, technology infrastructure, finance, human resources, and stakeholders.

(1) Space: physical and virtual space for academic activities;
(2) Technological infrastructure: digital equipment, tools, facilities, and methods for academic activities;
(3) Finance: funding to develop and maintain digital scholarship projects and services;
(4) Human resources: capacity of university staff to provide DSSs;
(5) Stakeholders: participation and engagement of the academic community (including researchers, lecturers, and learners) and related individuals and

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units.

- Service governance: service development policy and the service governance model are two elements that need to be considered.

5. METHODOLOGY

This study used a qualitative research approach by means of individual in-depth interviews that allow collection of detailed information on respondents' perspectives based on their own experiences (Lune & Berg, 2017). This method of data collection makes it possible for the study to provide greater insight into the current state of DSSs at VNU-HCM.

Data collection was carried out at the six member universities of VNU-HCM and the Central Library. The study did not collect data at An Giang University because this institution has not been completely merged into VNU-HCM, so it is assumed that it does not reflect the reality of supporting digital scholarship in the system. Meanwhile, the study conducted data collection at the Central Library because this unit is responsible for coordinating the activities of member universities' libraries.

To investigate the practice of providing DSSs at VNU-HCM, the study brought the context of VNU-HCM at both macro and micro environment levels together based on Layder's (1993) approach (Table 1).

5.1. Sampling

Participants for in-depth interviews were recruited using a purposive sampling strategy. Purposive sampling allows the researcher to recruit 'information rich' cases, namely those who have knowledge and experience of the research problem makes them likely to provide data that are relevant to the research aim (Pickard, 2013). Accordingly, the participants of this study needed to have a certain understanding and experience of academic activities in the defined research context. To ensure this, the study conducted interviews with the following groups:

(1) Managers of member universities of VNU-HCM. This group of people manages training and research activities.
(2) Managers of member universities' libraries of VNU-HCM and the Central Library.
(3) Lecturers who have at least five years of teaching experience and have conducted at least one research project.
(4) Postgraduate students (masters, doctoral students) who have completed at least one semester in the program and are in the process of carrying out their research.
(5) Undergraduate students who have completed at least two semesters in the program and have experience in conducting student research projects.

Considering the available resources, the study selected a sample size of 31 to conduct in-depth interviews. For each group, the study invited one participant from each member university. A member of the Central Library's board of management was also invited to take part in the research. Managers of member universities' libraries were contacted first and they were used as key informants to invite university managers, lecturers, and postgraduate and undergraduate students in their universities to participate in the research. Interviewee selection was based on their willingness. Details of the study participants are presented in Table 2.

5.2. Interview Protocol

The preliminary framework for DSSs was used to identify three key topics of the interviews: existing DSSs, resources required to implement DSSs, and service governance.

Participants who were interested in taking part in the study were sent an information pack with an invitation letter, information sheet, and a consent form. In order to collect as much information as possible on the practice of providing DSSs at VNU-HCM, the three key topics and guiding questions (Appendix) were sent to the partici-

Table 1. Context of VNU-HCM at both macro and micro environment

Context - Macro environment	- Digital transformation in higher education - University autonomy
Setting	Six member universities of VNU-HCM, Central Library
Situated activity	Teaching, learning, research
Self	Digital scholarship services (University managers, library managers, lecturers, learners)

VNU-HCM, Vietnam National University Ho Chi Minh City.

Table 2. Study participants

Participants	Institutions						
	USSH	UT	US	IU	UEL	UIT	Central Library
University managers	X	X	X	X	X	X	
Library managers	X	X	X	X	X	X	X
Lecturers	Faculty of History	Faculty of Chemical Engineering	Faculty of Mathematics and Computer Science	School of Biotechnology	Faculty of Economics	Faculty of Software Technology	
Postgraduate students	- PhD - Second year - Library Science	- MSc - Second year - Electronics Engineering	- MSc - Second year - Computer Science	- MSc - Second year - Electronics Engineering	- PhD - Third year - Business Administration	- MSc - Second year - Information System	
Undergraduate students	- BA - Third year - Educational Studies	- BSc - Second year - Construction Engineering	- BSc - Second year - Environmental Science	- BE - Second year - Industrial & Systems Engineering	- BA - Third year - Civil Law	- BSc - Third year - Information Technology	

USSH, University of Social Sciences and Humanities; UT, University of Technology; US, University of Science; IU, International University; UEL, University of Economics and Law; UIT, University of Information Technology.

pants in advance of the scheduled interview to help them focus and understand the scope of the interview.

5.3. Data Analysis

The study used a qualitative content analysis method through the following steps.

- Step 1: After each interview, one researcher transcribed the audio record word-by-word and then thoroughly listened to the recording twice to check the accuracy of the transcript. The transcribed version of the interview was then sent to the participants to allow them to double check what they said during the interview.
- Step 2: Based on the preliminary framework for DSSs, the following categories and their sub-sets were defined prior to data analysis: existing DSSs, resources, and service governance.
- Step 3: Interview transcripts went through a coding process to generate codes from data under the preconceived categories as well as to identify new categories and subcategories. Themes identified through content analysis were tabulated in Excel along with the corresponding data and participants. This process went through three rounds using member-checking to ensure the trustworthiness of the data. In the first round, each of the three-member research team was primarily responsible for analyzing one-third of the total interview transcripts. In the second round, the analysis results were checked by the remaining two research members. This was followed by a roundtable discussion among the three members to come to a consensus on different points of view in the data analysis process. No new categories and subcategories emerged from the interview data.

All interviews were conducted in Vietnamese. A number of comments were translated into English for presentation in the finding section.

6. FINDINGS

6.1. Implementation of Digital Scholarship Services

6.1.1. Existing Digital Scholarship Services

Research results show that VNU-HCM has not had a comprehensive DSS system at both VNU-HCM system and member university levels.

At the system level, the research results indicate the absence of centers, departments, and projects related to DSSs except for some activities carried out by the Central Library. One of the university managers said that "We mainly rely on our university's conditions to support digital scholarship for lecturers and learners. There is no cen-

ter or department responsible for coordinating this activity from VNU-HCM." DSSs were mainly provided at the member university level rather than at the system level. In this context, the Central Library is expected to deliver system-level DSSs. However, the study shows that DSSs were still underdeveloped in this library's service system. This was confirmed by the manager of the Central Library:

> Oversea university libraries deliver many DSSs [...] But for us, with very limited resources, we mainly make an effort to maintain the provision of databases so we have not implemented any other support activities yet. Users can also use the library space for learning and research.

It can be seen that the provision of electronic databases and space by the Central Library was still considered the main digital scholarship support activity at the system level.

At the member university level, the six member universities had more activities to support digital scholarship, although these were not yet systematically implemented and did not really meet users' needs. The research data show that DSSs were provided internally by each member university. There was no uniformity and very little cooperation among the six members. They provided a number of services that fell within the following five DSS groups: (1) research project management, (2) digital data management, (3) providing digital methods, tools, and information resources, (4) digital sharing and publishing, and (5) digital scholarship connections.

For research project management, six services were identified including (1) information provision, training, and seminars on research management; (2) information provision, training, and seminars on copyright and intellectual property; (3) supporting the planning of research project management; (4) Supporting the implementation of research projects; (5) help in seeking and applying for research funding; and (6) copyright registration (Table 3). The USSH was the only one to not indicate the presence of any service in this service group, while the other member universities provided at least one service. The UIT provided the most services (four). Help in seeking and applying for research funding appeared in four out of six member universities. In the meantime, there were two services offered by only one member university: (1) in-

Table 3. Services on research project management

Services	USSH	UT	US	IU	UEL	UIT
Information provision, training, and seminars on research management				X		X
Information provision, training, and seminars on copyright and intellectual property						X
Supporting the planning of research project management		X			X	X
Supporting the implementation of research projects		X				
Help in seeking and applying for research funding		X	X	X		X
Copyright registration		X			X	

USSH, University of Social Sciences and Humanities; UT, University of Technology; US, University of Science; IU, International University; UEL, University of Economics and Law; UIT, University of Information Technology.

Table 4. Services on digital data management

Services	USSH	UT	US	IU	UEL	UIT
Data search and collection					X	
Data cleaning and standardization					X	
Data storage						X

USSH, University of Social Sciences and Humanities; UT, University of Technology; US, University of Science; IU, International University; UEL, University of Economics and Law; UIT, University of Information Technology.

formation provision, training, and seminars on copyright and intellectual property; (2) supporting the implementation of research projects.

The digital data management services group seems to receive little attention from member universities as only three services were identified, including (1) data search and collection; (2) data cleaning and standardization; and (3) data storage (Table 4). At the same time, these three services were only available in two of the six member universities. There was an absence of many research data lifecycle management services.

The service group related to providing digital methods, tools, and information resources was considered the most popular and provided by the most member universities. Six services belonging to this service group were recognized, including (1) providing a venue for digital data processing; (2) providing digital tools; (3) providing data storage space; (4) supporting the use of digital tools and methods in research; (5) supporting the use of digital tools and methods in teaching and learning; and (6) providing information resources (Table 5). Two of the six services in this group were delivered by all member universities: (1) supporting the use of digital tools and methods in teaching and learning, and (2) providing information resources. Meanwhile, the provision of data storage space was offered by only one member university.

For digital sharing and publishing, three services were identified: (1) consulting/training/workshops on how to publish; (2) assisting with publishing in institutional repositories; and (3) assisting with publishing in scientific journals (Table 6). Five out of six member universities provided assistance with journal publication. Meanwhile, assisting with publishing in institutional repositories was implemented by only one member university. The UT provided the most services in this group (three services).

For digital scholarship connections, participants indicated the presence of three services: (1) organizing events and discussions about research using digital methods and tools; (2) providing a physical venue for academic interaction; and (3) connecting researchers (Table 7). Research data show that organizing events and discussions about research using digital methods and tools was implemented by only one member university, while the other two services were offered by four out of six member universities.

6.1.2. Parties Involved in the Provision of Digital Scholarship Services

The results of the data analysis show that DSSs at

Table 5. Services on providing digital methods, tools, and information resources

Services	USSH	UT	US	IU	UEL	UIT
Providing a venue for digital data processing		X		X		X
Providing digital tools (software, hardware…)		X	X	X	X	X
Providing data storage space						X
Supporting the use of digital tools and methods in research	X	X	X	X	X	
Supporting the use of digital tools and methods in teaching and learning	X	X	X	X	X	X
Providing information resources	X	X	X	X	X	X

USSH, University of Social Sciences and Humanities; UT, University of Technology; US, University of Science; IU, International University; UEL, University of Economics and Law; UIT, University of Information Technology.

Table 6. Services on digital sharing and publishing

Services	USSH	UT	US	IU	UEL	UIT
Consulting/training/workshops on how to publish	X	X	X			X
Assisting with publishing in institutional repositories		X				
Assisting with publishing in scientific journals		X	X	X	X	X

USSH, University of Social Sciences and Humanities; UT, University of Technology; US, University of Science; IU, International University; UEL, University of Economics and Law; UIT, University of Information Technology.

 https://doi.org/10.1633/JISTaP.2022.10.1.1

Table 7. Services on digital scholarship connections

Services	USSH	UT	US	IU	UEL	UIT
Organizing events and discussions about research using digital methods and tools						X
Providing a physical venue for academic interaction	X	X	X	X		
Connecting researchers		X	X	X	X	

USSH, University of Social Sciences and Humanities; UT, University of Technology; US, University of Science; IU, International University; UEL, University of Economics and Law; UIT, University of Information Technology.

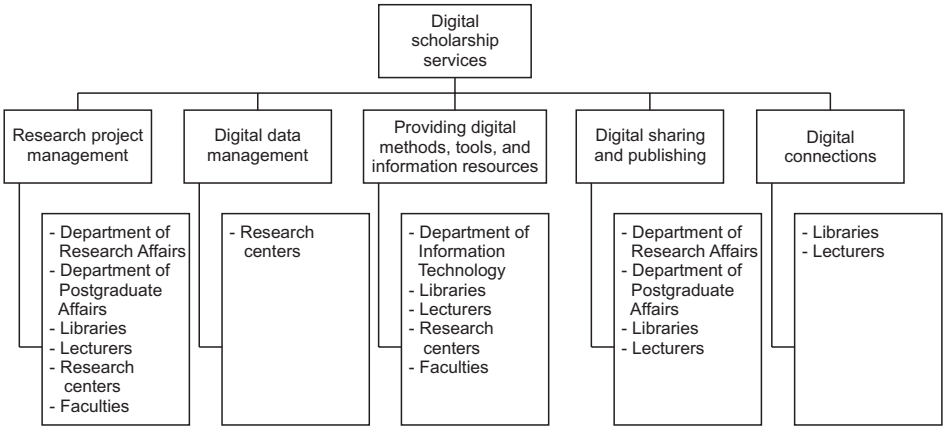


Fig. 2. Parties involved in the provision of digital scholarship services.

VNU-HCM's member universities were primarily provided by the following units: the Department of Research Affairs, Department of Postgraduate Affairs, Department of Information Technology, libraries, research centers, and faculties. In addition, there was digital scholarship support from lecturers or research groups rather than being formally provided by the universities. The results of this study indicate that the above individuals or units delivered various DSSs (Fig. 2).

The presence of libraries in four out of five groups of DSSs, except for digital research data management, showed the important role of libraries in digital scholarship, as acknowledged by one of the lecturers: "When it comes to digital scholarship, I immediately think of libraries."

Member universities' research centers also offered a number of DSSs related to (1) DIGITAL research project management, (2) digital data management, and (3) providing digital methods, tools, and information resources. Specifically, the managers of the member universities said that research centers assisted in finding research funding: "My university's Innovation Center supports finding research funding sources from organizations and provinces" as well as collecting and cleaning data: "The Center for Economic and Financial Research buys the Thompson Reuters database as well as helps to collect and clean data."

The Department of Research Affairs and the Department of Postgraduate Affairs mostly provided services related to (1) research project management and (2) digital sharing and publishing. This was reflected in the following statements of both a university manager and a postgraduate student: "The Department of Postgraduate Affairs provides advice to students on doing research and writing theses and papers," and

> The Department of Research Affairs often organizes seminars and workshops to enhance lecturers' understanding and skills of doing research […] Although they do not mention digital scholarship, the content and discussions refer to the value and foundation of digital scholarship.

Faculties focused on running DSSs related to (1) research project management, and (2) providing digital methods, tools, and information resources. These included training courses and guidelines about learning and research activities or providing digital materials, as shared by both a postgraduate student and a library manager:

"Our faculty organizes seminars and trainings for lecturers and students with the participation of foreign researchers," and "Some faculties provide additional digital materials for their lecturers and students."

The Department of Information Technology also supported digital scholarship activities, mainly in terms of infrastructure and digital means and tools, as confirmed by a lecturer: "The Department of Information Technology supports the installation of software and provides instructions on how to design online lessons."

Research results show that there was also support from lecturers or research groups for learners and colleagues in most service groups, except for digital data management. Such support might include providing digital tools, as a lecturer said: "I sometimes receive digital tool-related support from research groups"; or providing materials, as confirmed by a postgraduate student: "My lecturer can download some materials for me that I cannot download because of the cost." Leaving lecturers or research groups to solve the problem of digital tools on their own might lead to a concern that the quality and validity of digital tools cannot be guaranteed; in particular, some of the software were provided to learners in the form of pirated versions. One of the university managers said that: "There are expensive software tools that the university cannot support. Therefore, most lecturers have to find a way to use them. This may lead to copyright infringement."

6.1.3. Evaluation of Digital Scholarship Services

Some DSSs, although not many, received positive feedback from research participants in terms of service attitude and costs to use DSSs.

Specifically, the staff were very supportive and had a good attitude when providing services, as commented by a lecturer: "The staff of the Department of Research Affairs [are] very enthusiastic in advising and guiding the application for research funding"; one of the students also said that: "The librarians are very supportive in searching for articles in the databases." At the same time, "Currently the services are completely free," as shared by a postgraduate student, was also considered a plus point for DSSs at member universities.

In addition to the positive responses, the results of the data analysis reveal the limitations of the DSSs currently being provided. The responses largely concentrated on providing information resources and digital tools. This could be attributed to the fact that these were the most common services offered by all member universities, as described in Subsection 6.1.1.

Among the existing DSSs, the provision of information resources was considered one of the basic services provided by all member universities. It therefore received lots of feedback on quality improvement. Research participants indicated that the provision of information resources did not meet the needs of users. Access to full-text databases was very limited, as a lecturer commented: "During my research I used some databases of both libraries, but most of the databases only provide access to abstracts of articles rather than the full text." In addition, information resources were not fully updated to help researchers have appropriate sources for research purposes, especially in the fields of natural sciences and engineering. One of the lecturers said that "VNU-HCM's digital information resources are not up-to-date [...] my university's researchers cannot access the latest articles in our research area." The lack of digital resources was also mentioned by one of the lecturers: "Libraries mainly provide printed materials instead of electronic documents which are essential for digital teaching activities." Although institutional repositories are considered popular at universities around the world, VNU-HCM's member universities have not paid much attention to building their own institutional repository to take advantage of their academic community's own publication. A library manager said that "The university has not collected and distributed scientific publications authored by lecturers." The search system was also not convenient and easy to use according to the following statement of a postgraduate student: "In the past, I searched for documents through the Central Library's search system, but I found that this was too complicated, so I then only use the materials in my university library."

As for the provision of digital tools, although there were certain supports in terms of digital tools and methods in teaching and learning, it is said that the university had not yet responded to the demand for use in practice. Online learning systems were considered unstable, as one of the university managers commented: "Although online teaching is encouraged, it is not based on a stable platform." In addition, the tools to support learning and research activities had not yet met the actual needs, as said by one of the postgraduate students: "The university provides us with experimental servers that I can remotely control to work. However, this server does not meet the requirements of the research topic, so we have to rent the machine ourselves from outside services."

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6.2. Resources for Implementation of Digital Scholarship Services

Research results show that despite efforts to improve resources in recent years, in general member universities still face many challenges in terms of resources to implement DSSs.

6.2.1. Space

The space mentioned by research participants was mainly group study rooms for learners and research rooms for lecturers. These spaces had been improved to support academic activities as confirmed in the following statement by a postgraduate student: "The library has research rooms. The library has been repaired recently, so the space for academic activities is much better."

Although the physical spaces had been greatly improved, the study participants still believed that the necessary facilities for academic activities were not provided satisfactorily. Taking self-study rooms as an example, one of the students said that:

> The number of rooms for self-study is quite small while there are a large number of students in my university […] Self-study rooms are only equipped with desks and chairs. They don't even have an electric socket for students to plug in their laptops in case the batteries run out.

At the same time, the space for researchers was still quite limited, as said by one of the lecturers: "An associate professor even does not have his own workplace." Besides this, the lack of development of digital spaces could also be seen as a barrier to DSSs, as indicated by a postgraduate student: "In terms of digital space, it is quite limited, almost nothing."

6.2.2. Technology Infrastructure

Similar to the space matter, member universities' technology infrastructure had improved dramatically over the past few years, as confirmed by one of the lecturers: "My university's technology infrastructure has been upgraded […] Five years ago the technology infrastructure had many limitations, but the system has been much improved in recent years."

Although there was an improvement in technology infrastructure, research participants showed that member universities needed to pay more attention to this issue in order to implement DSSs effectively. Technology infrastructure was said to be old and unsustainable, as confirmed by one of the library managers: "The technology infrastructure has not been built as in some way sustainable. It is old and often damaged. As a result, it is difficult to implement new services."

In addition, one of the university managers said that the investment in technology infrastructure was fragmented and not comprehensive: "The development of DSSs requires the synchronization of both technology infrastructure and data. However, this has not happened in practice in member universities."

Website and Internet access were the issues that were mentioned most frequently by the study participants. The lack of stability of the website system might affect the provision of services. This was reflected in the following comment of a lecturer: "My university's website is often down. The current information technology system of my university does not ensure the effective implementation of DSSs to the academic community at large." Furthermore, the slow Internet connection speed had caused great difficulties for academic activities. One of the students said that "The Internet connection speed is very slow. We have to buy a 4G Internet package ourselves to access the Internet."

6.2.3. Finance

Several financial aspects were also mentioned to show the impact of this resource on the delivery of DSSs. First, libraries had limited funding support to develop information resources, as said by a lecturer: "The library responded to me that there were many databases that we could not access the full-text articles due to insufficient funds." Second, financial support to purchase digital tools for teaching and research had also not met the demand. One of the library managers said that "The limited funding means that we do not dare to invest more in digital tools."

6.2.4. Human Resources

As mentioned in the research context, VNU-HCM in general and its member universities in particular have a large number of staff. This can be seen as an advantage when implementing DSSs. However, the research results show that there are still many concerns around the service delivery capacity of this workforce. Specifically, there was an opinion that staff knowledge and skills to support research were limited, as shared by a lecturer: "Current human resources can only support the general administrative tasks of the university, but they do not have the capacity to support the lecturers in the process of conducting research." Not only that, delays in implementing

DSSs could result from the limited capacity of librarians. According to a library manager, "The library is still weak in providing DSSs because of limitations in the capacity of librarians."

6.2.5. Stakeholders

The research results indicate two issues that need to be resolved related to stakeholders when implementing DSSs at VNU-HCM in general and member universities in particular: cooperation and awareness.

As described in Subsection 6.1.2, the current provision of DSSs originated from the Department of Research Affairs, Department of Postgraduate Affairs, Department of Information Technology, libraries, research centers, faculties, and lecturers. Available evidence shows that the stakeholders did not have a systematic coordination in building and providing DSSs. One of the library managers said that

> During the past few years, the library has always tried to connect the university and the Central Library because there was a lack of collaboration between the two sides. […] There is also a lack of collaboration between units within the university in delivering such services.

At the same time, not all stakeholders were aware of the importance of digital scholarship to implement DSSs, as indicated by a university manager:

> The problem of underdevelopment of DSSs may arise from receiving low awareness of the importance of this activity by middle-level managers. They may think that doing research is only an additional responsibility, so they do not promote the implementation of DSSs.

6.3. Digital Scholarship Services Governance

6.3.1. Service Development Policy

Research results show that the universities also had ideas surrounding the development of digital scholarship and supporting services to meet the requirements of the transformation in teaching, learning, and research. This was confirmed by some university managers: "Ten years ago, my university also had discussions related to digital scholarship development, but it has not been well implemented," and "In previous years, the issue of digital scholarship development has been discussed, but many things are needed to implement it."

VNU-HCM in general and member universities did not have a clear strategy for how to develop digital scholarship. This might lead to paying insufficient attention to the policy of developing DSSs, or a lack of investment in resources to support the development of DSSs, as well as a lack of systematicity in the implementation of DSSs. One of the university managers said that

> Developing digital scholarship requires having a clear strategy. That is the basis for developing supportive policies as well as carefully analyzing related issues such as funding, infrastructure, etc. And these should have been done 10 years ago.

The library managers also reinforced this point of view when they said that

> From 2010 up to now, each library has used a different software [...] despite having money, the criteria for purchasing software have not been properly determined from the early stages [...] There are half-done and abandoned projects.

And

> Library software cannot handle the simultaneous access of many users [...] Digital transformation has problems when we cannot predict future needs.

6.3.2. Service Governance Model

Research results show that existing DSSs were mainly implemented and managed at the member university level. One of the university managers said that "Because there is no common policy on the management of academic activities of VNU-HCM, member universities manage their digital scholarship support activities based on their own conditions."

At the member university level, DSSs were mainly provided by a few units, as described in Subsection 6.1.2. At the same time, these services were managed separately by those units instead of being systematically implemented under a common service management policy at each member university. This was reflected in the following opinions of library managers:

> If the library finds that there is any academic activity that needs our support, we will plan and implement it ourselves. Currently, there are no common service management policies for all departments in my university.

And

> My university provides a lot of support for digital scholarship activities but we have not yet established a service system. If units realize that they can do something, they just implement it themselves.

7. DISCUSSION

Although VNU-HCM has been making efforts to achieve the goal of digital transformation, this study found that there were still limitations in digital scholarship supporting activities. Although VNU-HCM is a system of several member universities and affiliated institutes, centers, and units, DSSs were delivered separately at member universities instead of being implemented systematically under cooperation between member universities. In each university, there is even a lack of linkage between supporting digital scholarship units. This situation has posed a requirement to promote cooperation at both levels: within each member university and among member universities. The cooperation helps to effectively utilize the resources available in the system as well as ensure fairness and convenience in accessing the DSSs of the academic community of VNU-HCM. In addition, the role of the managers of VNU-HCM in orienting, coordinating, and managing the DSS system is essential to promote collaboration and resource sharing among member universities. Systematic and interconnected development of DSSs is also needed to reduce the pressure on lecturers because the research showed that lecturers sometimes had to provide support for learners' digital scholarship activities. Although learners often build their own networks for learning with the support of stakeholders, including lecturers (McNicol, 2003), the personalization of academic support that should be provided by the institution, for example the provision of learning materials, can create pressure on lecturers and may not guarantee the quality of such support.

Although the existing DSSs had not been implemented systematically, the presence of a number of DSSs at member universities could be seen as a positive signal of transformation in supporting academic activities. No new DSS groups emerged beyond the five DSS groups presented in the theoretical framework. Existing DSSs are the basis for the development of a future DSS system. This research reinforces the results of previous studies conducted by Li et al. (2020), Gbaje et al. (2020), and Ocran and Afful-Arthur (2021) to provide a comprehensive picture on the practice of providing DSSs at higher education institutions. To ensure that DSSs maximize their functions for academic activities, the existing DSS system needs to be complemented with the addition of specific services under the five groups of services identified, typically digital data management services. At the same time, service quality also needs to be improved because some of the most popular services, such as providing information resources and digital tools, had not yet met the needs of users. In addition, an investigation of user needs should be carried out to ensure the provision of an appropriate DSS system (Lippincott, 2017).

Being one of the two key national universities in Vietnam, VNU-HCM has received a great deal of attention and support from the government to improve the facilities of member universities in recent years. However, the results of this study showed that the existing resources, including space, technology infrastructure, finance, human resources, and stakeholders, still did not meet the requirements to effectively implement DSSs at both the system and the member university level. There were no resource-related constraints other than the five factors mentioned above. The results of this study are consistent with those reported in some previous studies, such as Clay (2016), Lippincott (2017), and Koga (2018), showing that resource-related challenges are common problems for many universities in the world, not only VNU-HCM. In the process of implementing DSSs, VNU-HCM needs to consider these factors to ensure the success of the service system. The improvement and development of these resources is a big challenge for VNU-HCM in the context that member universities have entered the stage of autonomy. Therefore, the collaboration and systematic management in the implementation of DSSs is once again raised to contribute to reducing the pressure on the resources of member universities as well as for ensuring the sustainability of the DSS system (Clay, 2016). In addition, improving the capacity of human resources for DSSs is necessary to interact effectively with the academic community, in particular the capacity to implement a service and the understanding of research activities (Clay, 2016). There is a need to implement various training programs and continuing education for existing staff to build capacity for digital scholarship support, especially librarians (Gbaje et al., 2020). It is also necessary to focus on raising stakeholder awareness of the importance of digital scholarship, supporting services, and collaboration as this can create motivation in digital scholarship activities (Lippincott, 2017; Tzoc, 2016).

The development of a DSS system should be done with

an appropriate policy and governance model. The results of this study showed that VNU-HCM in general and its member universities in particular did not have a clear digital scholarship support policy. This might be one of the reasons for the lack of completeness in the DSS system as well as the limitations in the resources required to implement DSSs. Therefore, the development of a strategic plan along with policies to support digital scholarship is necessary to ensure the sustainability of the DSS system. Since VNU-HCM is a system of several members, it is suggested to consider the use of a network model in the managing of DSSs because this model encourages cooperation among stakeholders at different levels (Maron & Pickle, 2014). With this model, VNU-HCM can provide DSSs based on building a key center in the role of general coordinator (larger scale, possibly the Central Library), and satellite centers (smaller scale, belonging to member universities). The suitability of the network model needs to be further corroborated by later research stages to complete the DSS framework for VNU-HCM.

8. CONCLUSION

The study provides an understanding of the practice of providing DSSs at VNU-HCM from the perspective of multiple stakeholders, including university managers, library managers, lecturers, and learners. Research results showed that there were digital scholarship support activities implemented at member universities of VNU-HCM. However, these supports were limited in terms of both quantity and quality. The development of DSSs at VNU-HCM faced many challenges that could be encountered across educational institutions around the world, such as the lack of necessary resources. However, issues related to collaboration, service development policy, and the service governance model are considered noticeable issues at VNU-HCM. These issues need to be addressed to promote the development of effective DSSs for VNU-HCM to meet the requirements of digital transformation in higher education.

The development conditions and governance model of VNU-HCM are different from many other universities in Vietnam because it is one of the two key national universities in this country, meaning that the results can only be generalized with caution. However, the research results partly reflect the general situation of digital scholarship support at Vietnamese universities because they are all placed in the same context of digital transformation and autonomy in higher education. It is suggested that an extensive study with multiple universities in Vietnam is needed to provide a more complete picture of the practice of DSSs in the country. The findings and issues drawn from this study are not only useful references for universities in Vietnam but also for higher education institutions in other developing countries.

The study used a relatively small sample size to fit within available resources. Conducting further interviews with a larger sample, especially with lecturers and postgraduate and undergraduate students, could reflect more deeply on the practice of providing DSSs at VNU-HCM. This should be addressed in future studies.

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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APPENDIX. Interview protocol

Focus of interview	Participants	Questions
Existing DSSs	University managers/library managers	How does the university/library support digital teaching/learning/research activities?
	Lecturers	How are you supported in digital teaching activities/conducting digital research?
	Students	How are you supported in digital learning activities/conducting digital research?
Resources required to implement DSSs	University managers/library managers	What resources are needed to implement DSSs? How would you evaluate the current state of those resources at your university/library?
	Lecturers	
	Students	
Service governance	University managers/library managers	How does the university/library manage DSSs? How would you evaluate the management of DSSs at your university/library?
	Lecturers	How would you evaluate the management of DSSs at your university/library?
	Students	
Other	All	Is there anything else you would like to share about DSSs not already covered here?

DSS, digital scholarship service.

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Development of ASEAN Network Model on Information Literacy

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ABSTRACT

This study aimed at overviewing the situation of information literacy education and research in the Association of Southeast Asian Nations (ASEAN) region, and developing an ASEAN network model on information literacy. This research used documentary and qualitative research methods. Key resources consisted of twenty bibliometric studies and related documents and two groups of key persons. The first group consisted of twenty-seven purposive key persons from eight countries, and the second group consisted of seven key persons from five countries. The research instruments comprised a data collection form and focus group/interviewing forms. Data was collected by focus group discussion and online interviews, and qualitative content analysis was used in data analysis and presented descriptively. Research findings showed that: 1) information literacy education and research in the ASEAN region varied across countries and placed importance on the educational context. Singapore was found to be the most leading and productive country in ASEAN in information literacy with the highest number of journal articles on the international scale, and was among the most contributing groups at the regional and global level; 2) the ASEAN Network on Information Literacy (ASEAN-NIL) has been developed as a model with its principles, objectives, management system, activities, and promotion strategies. Its strengths are an integrated scope, multidimensional orientation, and interdisciplinary and collaborative partnerships at the national, regional, and international level, suitable for the ASEAN context, the online environment, and the digital educational ecosystem.

Keywords: information literacy, ASEAN, networking, LIS education, LIS research

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1. INTRODUCTION

Information literacy plays a significant presence in library and information science (LIS) and has been an ongoing issue of interest and widely discussed with many different approaches, views, perspectives, and a variety of definitions and concepts. This has expanded the territory of information literacy and adds to its value as a currently growing and required skill and metaliteracy. Information literacy has developed from a librarianship-focused notion to a multidisciplinary area that encompasses other disciplines wider than the social sciences. As one global prime concern, information literacy has revealed a high impact on sustainable development goals (Abdulrahman et al., 2019; Madu et al., 2020). The COVID-19 pandemic and the "new normal" have put information literacy in the spotlight with a more integrated, dynamic, and holistic view as well as as becoming a central and survival skill of the digital age. It is, therefore, critically important that the international community contribute to information literacy development.

Networking provides various opportunities for academicians, researchers, and professionals to share their knowledge and proficiencies. The ability to fulfill the common aim of increasing the productivity, quality, and impact of information literacy teaching, learning, and research is strengthened by networking. There has been a long tradition of LIS cooperation, and library networking is one model for library development and an inevitable trend in LIS, to cope with globalization and changes in the profession and education, moving more towards internationalization (Sacchanand, 2018). Since information literacy is a global issue of interest, many information literacy networks have been formed, especially in western countries and mostly in Europe, to connect educators, researchers, and information professionals in the area of information literacy and related areas. However, none have been formed in the ASEAN and ASIA region.

The Association of Southeast Asian Nations (ASEAN, 2020) consists of ten member countries in Southeast Asia with noticeable differences with regard to levels of socioeconomic development, literacy rate, population density, gross domestic product (GDP) per capita, information and communications technology (ICT) development, cultural and social environment, geography, religion, language, and education policy, system, and structure. These ten ASEAN countries have numerous commonalities, infinite prospects, and a wealth of resources, despite their disparities, diversity, and development gaps. As stated in the ASEAN Charter, one purpose of ASEAN is "to develop human resources through closer collaboration in education and lifelong learning for the empowerment of ASEAN's people and the strengthening of the ASEAN community" (ASEAN, 2008). For this reason, ASEAN added value to human resource development and regional cooperation by strengthening deeper and wider cooperation for a more integrated and connected ASEAN, through its ASEAN vision, policies, master plans, strategies, and guidelines.

Collaborative networking is challenging ASEAN LIS educators, researchers, and information professionals to cope with changes in the profession, education, and society. With ASEAN's vision 2025 "Integrating Countries, Integrating Development" (ASEAN, 2021) as well as research findings showing that most ASEAN countries' contributions to LIS have been negligible, and research recommendations for collaboration in the region, especially in research activity to strengthening the LIS profession and professionals (Dacillo, 2018; Patra & Chand, 2009), and for collaborative networking in the ASEAN region (Sacchanand, 2017), specifically, ASEAN's network on information literacy (Sacchanand, 2016), this research is significant. This helps respond to ASEAN vision, mission, strategies, and master plans as well as the demand of LIS and the wider academic and professional community for more collaborative partnership and activities. The findings of this research study will help in reinforcing the development of information literacy, strengthening the roles of LIS educators, researchers, and professionals, and aiding the impact of LIS in the region to be more visible, moving from nationalization to regionalization and internationalization, and leading to more opportunities.

This research study aimed at overviewing the situation of information literacy education and research in the ASEAN region as well as developing an ASEAN network model on information literacy with promotion strategies.

2. RELATED LITERATURE

Since the term "information literacy" was coined and elaborated upon beyond traditional librarianship by Zurkowski (1974), president of the Information Industry Association, its connotation and denotation have been continually adjusted, revised, and expanded in response to the demand for a notion that prioritizes learning. To empower learners, information literacy is redefined as a metaliteracy (Mackey & Jacobson, 2011, 2014; Sukula, 2019) which can help expand the extent of popularly held

notions of information literacy in the digital context, where innovative collaborative technologies, social media tools, and online communities are challenging traditional definitions of information literacy.

2.1. Information Literacy Bibliometric Studies

Many bibliometric studies have been published, especially in international journals and information literacy literature. They differ to some extent, e.g., scope, specific objective, time frame, and database used to retrieve articles. Bibliometric analysis helps with mapping of the state of the art and identifying gaps and new directions in research and specific areas, as well as collaborative authorship trends.

An emphasis has been placed on literature on information literacy in ASEAN countries and the region as follows:

In the larger picture of LIS literature related to ASEAN, Patra and Chand (2009) identified LIS literature growth, core journals, and authorship pattern in The South Asian Association for Regional Cooperation (SAARC) and the ASEAN region as reflected through LISA (Library and Information Science Abstracts) during 1967-2005. It was found that Singapore was in the forefront of LIS research in ASEAN, followed by Malaysia. The results of the study called for more collaboration among SAARC and ASEAN member countries. It also identified the need for member countries of both the regional associations to formulate and implement information policies similar to that of Singapore.

Specifically, in terms of ASEAN countries' information literacy research outputs, Majid et al. (2015) discovered that from 2003 to 2012, the number of information literacy articles and conference papers published in SCOPUS increased steadily. Majid and Foo from Nanyang Technological University (NTU), Singapore were in fifth place with twelve publications and seventh place with nine publications among the top twelve authors, respectively. Malaysia was in fifteenth place in the list of information literacy publications distributed by country. This is consistent with findings by Kolle (2017) that the number of information literacy articles published on the Web of Science during the years 2005-2014 increased steadily. Magid and Foo from NTU were found to be productive authors and institutes, with equal contributions of eight articles each, and took the seventh rank, while NTU was the eighth most productive institute in total.

The bibliometric study by Karisiddappa et al. (2020) showed that global information literacy research papers published in SCOPUS from 2000 to 2019 have extended to as many as 118 nations. Social sciences was the most important subject in global information literacy research (with a 75.07% publications share). Significant keywords on global information literacy research include "Information Literacy" (4,179), followed by "Digital Literacy" (1,453), "Students" (928), "Education" (887), and "Media Literacy" (780). Among the top twenty most productive organizations, universities from western countries, especially the United States of America (USA), dominated. NTU, Singapore was in fourth place in the scientometrics profile of the top twenty most productive global organizations list and was the only university in ASEAN, and one of Asia's two universities in the list. Another is the University of Hong Kong, which was in the thirteenth place. Productive authors from ASEAN were Majid and Foo from NTU, ranking sixth and tenth, respectively. They were also found in sixth and eighth place, respectively, in Bapte's (2020) information literacy global research output published in SCOPUS during 1975-2002, while Singapore is the only Asian country in fifth place.

Bibliometric studies of individual journals have increased considerably, usually regarding the most prestigious journals in a given field. Focusing on LIS and the ASEAN region, the *Malaysian Journal of Library and Information Science* (MJLIS) has been the continuous subject of bibliometric studies by different researchers (Bakri & Willett, 2008; Brahma & Verma, 2018; Chaparwal et al., 2020; Garg et al., 2019; Kaur & Kamini, 2012; Kevin et al., 2009; Rajev & Joseph, 2016; Tiew et al., 2002; Velmurugan & Radhakrishnan, 2016; Yumnam & Singh, 2021). The findings can be summarized that the university publishing the journal under study, University of Malaya (UM), was the most prolific institute, with most papers published in the subject of bibliometrics and scientometrics (33.09%), while information literacy was ranked tenth (3.52%). Among prolific authors, UM's Kiran Kaur had the highest Citation Per Paper (CPP) value. Singapore, Thailand, and Indonesia were the third, sixth, and thirteenth ASEAN countries to contribute to MJLIS, with 5.35 percent, 4.76 percent, and 0.90 percent, respectively. The number of joint authors and multi-authored papers has grown.

Bibliometric studies on LIS single journals also showed that Singapore and Malaysia were visible in two biblometric studies of the *Journal of Information Literacy*; authors from Malaysia ranked ninth during the year 2007-2012, with one article (0.76%) (Panda et al., 2013), while during the year 2011-2015, findings of Tallolli and Mulla (2016) showed that Singapore ranked sixth (3.18%) most productive country and NTU ranked third (2.73%) most produc-

tive institution which contributed numbers of authors to the journal. Other LIS single journals that cover the information literacy area and with ASEAN contributions were included as follows: In the *Pakistan Journal of Library and Information Science* (1995-2010), Malaysia emerged as fifth place with four papers (3.10%) and Singapore as sixth place with two papers (1.55%). International Islamic University, Malaysia and NTU, Singapore were two institutional affiliations of authors with three and two papers, respectively (Warraich & Ahmad, 2011). In *Library Philosophy and Practice* (2014-2018), Malaysia ranked eighth with twenty-six papers (1.85%) and Indonesia ranked tenth with eight papers (0.71%), respectively (Kannan & Thanuskodi, 2019). Four ASEAN countries were ranked in country-wise authorship collaboration in *The Journal of Information Science* during 2005 to 2014. Singapore came in eighth place with fifteen papers (2.61%), and Malaysia was in seventeenth place with three papers (0.52%), while Thailand and Myanmar were tied for nineteenth place with one paper each (0.17%). The contributions of scholarly articles belonging to fifty-four countries and the United Kingdom, the country that publishes the journal under study, contributed the most with the highest number of papers (16.35%), followed by the USA (13.57%). The authorship trend is shifting towards multi-authorship as a result of collaborative effort (Gurikar et al., 2018). However, findings from the three LIS single journals, excepting the *Journal of Information Literacy*, can not be directly concluded as contribution to information literacy because of the wider LIS scope of the journals.

Even though it was found that international contributions from most ASEAN countries were negligible, the number of information literacy publications has constantly increased (Majid et al., 2015). Due to the increased number of co-authorship and partner countries, Asian information science research has progressed towards the international standard since 2001 (Chang, 2009; Tallolli & Mulla, 2016). The recommendations are for the Asia region as a whole to strengthen LIS research in the ASEAN region (Patra & Chand, 2009) and to encourage scholars in the region to participate in important international journals and conferences in order to increase awareness and reputation.

2.2. Information Literacy Networks

The information literacy networks all share the common goal of providing a platform or forum for educators, researchers, and professionals from across the country, region, and world to communicate, connect, discuss, and share ideas, new initiatives, knowledge, experiences, research, and practices with a wider network. Several efforts have been made to form collaborative networks of educators, researchers, and information professionals. The literature review showed that information literacy networks can be classified into national, regional, and international networks, or people networks, institutional networks, and online networks, and usually start from informal or volunteer groups on a voluntary basis. They differ from one another in initiative, affiliation, legal entity, official or unofficial role, or network management structure. Some networks are independent networks, while some are affiliated with or get support from organizations, library associations, and national professional associations or regional or international organizations.

Some key information literacy national, regional, and international networks included the Chartered Institute of Library and Information Professionals, Information Literacy Group (CILIP – ILG), formed in 2004; the European Network on Information Literacy (EnIL), in 2001; the European Conference on Information Literacy (ECIL), in 2013; and the Information Literacy Network of the Gulf Cooperation Council (ILN – GCC), in 2005. At the international level, the International Alliance for Information Literacy (IAIL), founded in 2003, and the International Federation of Library Associations and Institutions (IFLA), Information Literacy Section, are two prominent international networks that play important roles in information literacy. Even though these networks vary in some aspects, they all have the same common interests and contribute significantly to information literacy development nationally, regionally, and internationally. They organize international annual conferences that draw delegates from all over the world and from all sectors of higher and further education, as well as programs and activities for professional development, research, and practice, and education and training on various aspects of information literacy and related topics.

These collaborative efforts provide opportunities for new perspectives and new visions of information literacy as a convergence of disciplines, multiliteracies, metaliteracies, and transliteracies, moving towards a unified framework for information literacy and more collaborative networking. In the age of digital transformation and the new normal, and through the capabilities of digital technology, online networking expands opportunities for collaboration, strengthens continuing professional development and professional recognition, and increases quality, efficiency, and effectiveness.

2.3. ASEAN LIS Collaboration and Network

ASEAN was founded on a spirit of collaboration and cooperation. Great efforts have been made to develop regional networks, especially in the field of education. Some key LIS collaborative joint efforts in Asia include the International Conference on Asian Digital Libraries (ICADL) and Asian-Pacific Library and Information Education and Practice (A-LIEP), which were founded in 1998 and 2006, respectively. In specifically the ASEAN region, the Congress of Southeast Asian Librarians (CONSAL), the sole recognized regional professional association for librarians from Southeast Asian countries, was founded in 1970. It is regulated by the CONSAL constitution, which aims to foster ASEAN-wide connection building, sharing, cooperation, and collaboration. CONSAL's executive board, which is made up of three national members from each member country's national library and national library association, is in charge of achieving CONSAL's objectives. Members of CONSAL take turns hosting each conference, which occurs every three years.

Collaboration has been an issue of ASEAN's ongoing interest. In the analysis of the ASEAN LIS collaboration situation and management, Sacchanand (2016) found that most collaborative efforts began as informal collaborations, on the basis of a small group of ASEAN LIS educators' personal ties. External factors promoting cooperation included global trends, ASEAN community cooperation, and a paradigm shift in education and the LIS profession; and internal factors included profession and professionals' needs, as well as successful partnerships. External factors that hindered the management of cooperation included the development gap among member ASEAN countries, especially geographical, social, and economic development; ICT infrastructure; and LIS education development in each country. Internal factors included the readiness of countries and LIS institutions in terms of management, faculty, and students. The researcher proposed the 4S (Small-Spirit-System-Sustain) management strategies for ASEAN LIS cooperation.

3. METHODOLOGY

3.1. Research Design

Both documentary and qualitative methods were used in this study.

Twenty bibliometric studies and literature on information literacy related to the ASEAN region were used as key information sources for the analysis of ASEAN information literacy education and research situations. This was supplemented by focus group discussion and online interviews with twenty-two participants from three countries (Thailand, Malaysia, and Australia), who joined the focus group discussion at Sukhothai Thammathirat Open University (STOU), Thailand; and five key resource persons from five countries, namely Cambodia, Brunei, Philippines, South Korea, and Japan were interviewed online by appointment, making twenty-seven participants from eight countries in total. There was purposive sampling of those engaging in national, regional, and international collaborative information literacy activities. Due to the COVID-19 pandamic, the global crisis has forced the world to engage in the ubiquitous use of online learning, and permanently change, with new perspectives and new behavior. The second batch of online interviews with seven key persons from five countries was conducted in 2021 for the revised model that best suits the new normal and the digital educational ecosystem.

3.2. Research Instruments

Research instruments comprised a data collection form, a focus group discussion guideline, and a structured interview form. Data collection forms were developed to collect data from relevant documents, while a focus group guideline and a structured interview form were developed to collect data from face-to-face focus group discussions and online interviews.

3.3. Data Collection

The researcher limited the study of the situation of information literacy research of the ASEAN region based on the bibliometric studies published in international journals. The keywords "bibliometric studies" or "bibliometric analysis" and "information literacy" were used in the title or abstract or text along with the names of each ASEAN country, ASEAN, or ASIA to access and retrieve information from the international databases, namely ScienceDirect, Emerald, and Education Source, as well as from Google Scholar. The researcher performed manual examination of all the articles' contents. Finally, twenty bibliometric studies were used for the analysis.

The researcher also searched for information about the situation of information literacy education in ASEAN based on the key identified questions. The keywords "information literacy" or "information literacy education" and the name of each ASEAN country from the same databases, as well as from the websites of the national library associations, national libraries, and LIS higher education institutes of all ASEAN member countries, were

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included to find recent developments. Data was collected using the data collection form, which included four key points needed for the development of the ASEAN Network on Information Literacy (ASEAN – NIL). This was supplemented by face-to-face focus group discussions and online interviews, which were conducted to collect information about the situation of ASEAN information literacy education and research, their ideas and suggestions on the ASEAN network model on information literacy, and strategies for promoting the information literacy network. The second batch of online interviews with another group of seven key Thai and foreign resource persons was conducted in 2021 to revise and update the network model due to COVID-19, the biggest global crisis, and its impact.

Thematic content analysis was utilized to examine qualitative data from data collecting forms, focus group discussions, and interviews. On the basis of findings from bibliometric studies of information literacy, the ASEAN information literacy research situation was examined.

In addition, the database of ASEAN educators, researchers, and professionals on information literacy using the OMEKA open source program was developed as a prototype for the promotion of the network.

4. RESEARCH FINDINGS

Findings showed the following:

4.1. Situation of Information Literacy Education and Research in the ASEAN Region

It was found that information literacy has taken root in all ASEAN countries. It is one important area that has received attention in the library field, from LIS educators, researchers, and professionals. There was ambiguity in the interpretation on the meaning of the word, especially when translated into the official language of each ASEAN country, as well as in the perception and interchangeable use of the term "information literacy" with other literacy terms, especially media literacy and digital literacy which resulted in information literacy advancement. Information literacy education and research in ASEAN countries have been in progress and varied considerably from country to country. Information literacy education put importance on the educational context and there was no information literacy standard or model specifically for the ASEAN region.

The international organization UNESCO, through UNESCO Bangkok, was an active partner in the development and promotion of information literacy in ASEAN, particularly in Laos, Cambodia, and Myanmar. Information literacy has been the subject of seminars, conferences, training, workshops, and research. Two significant programs are UNESCO's Information for ALL Programme (IFAP) and the UNESCO MIL Alliance (UNESCO, 2021). Other contributing international professional organizations included IFLA, IATUL (International Association of University Libraries), SIDA (Swedish International Development Agency), and CONSAL.

Findings from the analysis of bibliometric studies showed that Singapore, NTU and Majid and Foo were the most productive country, university, and authors on information literacy in ASEAN, ranking among the top regionally and globally. Malaysia was the second most productive country, and UM's Faculty of Computer Science and Information Technology, the institution that publishes the MJLIS, was the most productive institution with affiliated authors. Thailand and Indonesia were also on the list, with contributions to information literacy research on an international scale.

On a global scale, Singapore, Malaysia, Thailand, and the Philippines were found to be involved with various regional and international activities on information literacy. Educators, researchers, and professionals from Singapore, Malaysia, and Thailand are on standing committees and program committees of the ECIL, as well as serving as ad hoc committees, peer reviewers, guest speakers, authors, or contributors. At present, a senior manager (Engagement) from the National Library Board from Singapore also participates as a member of the IFLA IL Section standing committee, and the president of the Philippine Association for Media and Information Literacy (PAMIL) serves as regional representative for Asia Pacific in the UNESCO MIL Alliance international standing committee.

Some unique contributions to the development of information literacy education and research in three ASEAN countries were found, including national policies, national professional associations, and international journals.

1) *National Policies*: Singapore as the leading country in information literacy was found to be the only country in the region that has national policies, strategic plans, guidelines, models, or frameworks both directly for and related to information literacy. The Ministry of Education as well as the Ministry of Communications and Information played important roles at the policy level which can affect the success of information literacy development in the country, through an integrated and holistic view and

collaborative partnerships between all stakeholders, with the National Library Board as the key player. Many existing information and media literacy public education programs have been implemented, with the National Library's S.U.R.E. (Source, Understand, Research, Evaluate) the most notable program.

2) *National Professional Association*: The Philippines is the only ASEAN country that has a national professional association directly connected to MIL. The PAMIL is a member of the UNESCO MIL Alliance, which promotes MIL as a lifelong learning skill and part of a knowledge-based society. Educators, media practitioners, librarians, information specialists, and MIL advocates gather at PAMIL events to share ideas and learn from one another.
3) *International Journals*: Malaysia was discovered to be the only ASEAN country to publish the Scopus-indexed MJLIS, a peer-reviewed LIS international journal that is well accepted by the academic community globally. Information literacy is one of the topics covered by the MJLIS as well as by another peer-reviewed journal, SJLIM (*Singapore Journal of Library and Information Management*), issued by the Library Association of Singapore, another key source of information literacy in ASEAN.

4.2. ASEAN Network on Information Literacy

The proposed model "ASEAN Network on Information Literacy (ASEAN – NIL)" was developed from literature review, findings from the first objective, the focus group discussion, and online interviews. In addition, the COVID-19 pandemic crisis and its wide-ranging and unprecedented impact, as the new normal and new norm emerge and shift to online patterns, were taken into consideration.

This proposed online model, the ASEAN – NIL, has its strengths in an integrated scope of information literacy, multidimensional orientation, interdisciplinary, and collaborative partnerships at the national, regional, and international level and is suitable for ASEAN, the online environment, and the new educational ecosystem.

4.2.1. Principle

Information literacy acts as a convergence discipline, a metaliteracy and multiliteracy for the development of information-literate learners, twenty-first century citizenship, and sustainable development.

4.2.2. Objectives

Three main objectives are as follows: 1) to be a network of educators, researchers, and professionals as well as organizations involved with information literacy and related areas in the ASEAN region; 2) to raise awareness of information literacy at the national and regional level; and 3) to encourage collaborative partnerships and support across all sectors related to information literacy, especially media and digital literacies in ASEAN, Asia, and worldwide.

4.2.3. Management System

This network is divided into three levels: 1) *at the national level*, a network of educators, researchers, and professionals who have a common interest in information literacy will be first formed as a special interest group based on personal ties on a voluntary basis. The network will be affiliated with the national library association, the national library, or any institution, depending on the situation of each country and governed by a standing committee. Strong support from the related ministries/government sectors of each country is needed; 2) *at the regional level*, the network will be governed by a regional standing committee comprised by the chair of the information literacy national committee or group of each ASEAN country. The regional chair rotates every two years among the members. The regional network is proposed to be affiliated with the ASEAN community or ASEAN Socio Cultural Community of ASEAN Secretariat, or A-LIEP, which has the same mission and is mostly run by LIS educators and researchers in ASIA; and 3) *at the international level*, the network will join and work as a member and partner of the UNESCO MIL Alliance and other national, regional, and international information literacy networks.

The ASEAN – NIL is open to members, both individual and institutional members from all ASEAN countries. Membership will focus on but is not limited to educators, researchers, and professionals involved with information literacy in the academic sector. Other related stakeholders such as non-governmental organizations (NGOs), publishers, and foundations will be eligible to join in various roles.

4.2.4. Activities

ASEAN – NIL will be a vital mechanism to promote and cultivate academic and research cooperation. Its online activities will focus on learning, producing, and sharing information in participatory digital environment, and continuing professional development through joint educational/teaching and learning activities, co-authorship, joint research, and joint professional activities.

The networked technologies, web portal, database, and

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virtual platforms (real time), as well as asynchronous facilitation (e-mail) and online platforms (MOOCs, online courses, and social networks such as YouTube, Twitter, and Facebook) will be developed to facilitate connections and support multi-way communication.

4.2.5. Promotion Strategies

ASEAN network promotion strategies were found to be one critical component in the development of the ASEAN – NIL. The network will launch a campaign to raise awareness of the network and work with a range of academic sectors on information literacy, media literacy, and digital literacy, with other stakeholders/related organizations, e.g., NGOs, publishers, and foundations. The awareness, commitment, and engagement of strong leaders and members, as well as strong support from the national library association, related ministries, and ASEAN community are critical for long-term viability and sustainability.

At the initial stage, the prototype database was developed to enhance communication among educators, researchers, and professionals in information literacy in ASEAN countries. The data elements in the database include Name, Surname, Degree, Academic position, Administrative position (if any), Affiliation, Bibliographical record, and Abstract of the publication. Information in the database can be accessed and retrieved by Name, Surname, Affiliation, Title, and Keyword. Reports can be displayed on the screen as well as in print formats. Data can also be saved, modified, and updated by the contributors. The web portal will be developed to be the platform for communication, collaboration, and networking among educators, researchers, and professionals to share, collaborate, and contribute their expertise and publications in information literacy and other related literacies.

5. DISCUSSION

The findings showed that alongside the growing importance and development of "information literacy" in the ASEAN region, there has been ambiguity and variation in the explanation and interpretation of the term "information literacy" in the national language of each ASEAN country. These findings agreed with the English term that has also been widely discussed and has undergone many reviews by many western scholars. This was also supported by findings from the extensive literature review on information literacy's characteristics and dimensions by Kay and Ahmadpour (2015), suggesting that the concept as well as the continual shift in emphasis of information literacy has grown continuously with the advancement in information technology.

Several studies have been conducted from the perspectives of scholars, professionals, and researchers in LIS and related fields on the similarities, differences, and interrelationships between the closely connected and integrated extent of information, media, and digital literacy. This has established a holistic learning environment and multidimensional framework for the development of information, media, and digital literate citizens in the digital environment (Sacchanand, 2020). UNESCO used one umbrella term "Media and Information Literacy (MIL)" in 2007, "to foster media and information literate societies through collaborating and forming alliances on a global scale" (UNESCO Institute for Information Technologies in Education, 2021).

Findings showed that education and research in information literacy varied across ASEAN countries. This was confirmed by research finding that social and technological advancements have had an impact on information literacy (Gurikar et al., 2018) and that most of the information literacy articles and prevailing models come from developed countries and western countries (Bapte, 2020; Bhardwaj, 2017; Dorner & Gorman, 2006; Gurikar et al., 2018; Tallolli & Mulla, 2016; Tokarz & Bucy, 2019).

Singapore was the ASEAN's most productive country and among the world's leading countries in information literacy research publishing. This resulted from the country's social, economic, educational, and technological development as well as LIS education and library development. Singapore is Asia's top performing economy (International Institute for Management Development, 2020) and is at the forefront of world-reputed university ranking systems, ranking first in QS Asia University Rankings 2021 and thirteenth in QS Global World Rankings (UniversityRankings.ch., 2021). LIS graduate programs play a critical role in LIS research generation, especially at the Ph.D. level. The Ph.D. program offered by NTU, Singapore has gained international recognition and information literacy is one area of research. In addition, NTU professors have also pioneered LIS regional collaboration proposals and research cluster formation in the region (Foo et al., 2006; Khoo, 2013; Khoo et al., 2003; Majid et al., 2003, 2015). Moreover, library development has played an important role in promoting information literacy, through the national policies launched by the government for over twenty years, including IT 2000 and Library 2000. The National Library has been at the forefront to increase

information literacy visibility and impact.

It was found that Malaysia ranked second among ASEAN countries in its research publication output in international journals, which is in line with the development of LIS education in Malaysia. The LIS Ph.D. program has been offered by UM, which was ranked ninth in the QS Asia University Ranking and fifty-ninth in the QS World University Ranking 2021 (UniversityRankings.ch., 2021). In addition, UM has published an international journal, MJLIS, since 1996. This helps increase the number of research publications by Malaysia, the UM, and the researchers affiliated with this university. This is in line with findings from bibliometric studies of MJLIS that UM, the institution that publishes MJLIS, is the most productive university with the most publications, authors, and prolific authors as well as highly cited authors (Bakri & Willett, 2008; Brahma & Verma, 2018; Chaparwal et al., 2020; Garg et al., 2019; Kaur & Kamini, 2012; Kevin et al., 2009; Rajev & Joseph, 2016; Tiew et al., 2002; Velmurugan & Radhakrishnan, 2016; Yumnam & Singh, 2021). Academic journals convey emerging knowledge, research findings, and the latest discoveries and developments, and they enable communication between researchers and scholars. This helps increase the credibility and visibility of the LIS scholar, institution, profession, country, and region.

As English is one official language and the medium of instruction in schools in Singapore and Malaysia, as well as being one of the most common languages spoken and used widely as a medium of education, communication, and government assemblies, so this is the language privilege of both countries in international academic communication. It is also worth noting two limitations of this study's research situation analysis: first, the analysis used bibliometric studies as the source of analysis rather than primary data; and second, it looked only at English research articles, excluding each country's national languages. Due to the diversity of national languages in ASEAN, it is strongly recommended that local researchers conduct a more in-depth investigation of each ASEAN country's information literacy research situation in both national and foreign languages in order to present the true information literacy research situation in each country.

The ASEAN – NIL, which was developed from an extensive literature review, focus group/interview discussions, and the analysis of the ASEAN situation of education and research, has its strengths and is in line with the 4S (Small-Spirit-System-Sustain) basic principle and collaborative management strategies as found by Sacchanand (2016). The model's integrated scope of information literacy is in line with the ideas of other national, regional, and international networks on information literacy (e.g., CILIP – ILG; EnIL; ECIL; ILN – GCC). In addition, this model is suitable for the ASEAN region because it has applied findings of the situation of information literacy education and research in the ASEAN region and responds to ASEAN's vision, mission, policies, master plans, strategies, and guidelines to strengthen deepen and wider cooperation for integrated ASEAN and ASEAN connectivity.

The collaborative partnership model, with interdisciplinary and collaborative approaches, is in agreement with the conceptual convergence between information, media, and digital literacy and also with many bibliometric findings showing that multiple authorships and degrees of collaboration have been increasing continuously (Baji et al., 2021; Bapte, 2020; Kolle, 2017; Nazim & Ahmad, 2007; Panda et al., 2013; Park et al., 2021; Tallolli & Mulla, 2016). This is in line with recommendations based on research findings of Chen et al. (2021) and Onyancha (2020) that interdisciplinary and collaborative approaches are required for effective information literacy delivery and quality scientific work in the complex information and learning environment.

6. CONCLUSION

The ASEAN – NIL was proposed for implementation through collaborative partnerships of national, regional, and international members and partners. This study will be beneficial to policymakers, educators, and researchers as well as professionals in policy formulation and implementation for the advancement of information literacy, LIS education, and research, library development, the LIS profession, and professionals as a whole. This is to cope with the twenty-first century changes and paradigm shifts in the profession and the new normal, and to align with ASEAN vision challenges.

There are still some interesting aspects about information literacy in the ASEAN region deserving further in-depth study, especially the information literacy situation of each ASEAN country, success factors, and lessons learned from success stories on information literacy development and implementation, and in bridging gaps through collaborative partnerships and networks.

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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Shifting Meme Content during Information Development on the COVID-19 Pandemic in Indonesia

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ABSTRACT

This research aims to identify and reveal the meaning of memes about COVID-19, and explain changes in meme content in regard to the information development of COVID-19 in Indonesia published by the mass media and online media. The data is sourced from memes that are shared on social media, especially WhatsApp groups in the period of January to June 2020. To reveal the meaning of memes, a semiotic analysis of Roland Barthes' model is used. Qualitative analysis is used to reveal the relationship between memes and the information development of COVID-19 in Indonesia. The results of the study show that meme content has shifted according to three stages of information development of COVID-19 in Indonesia published by the mass media and online media. When COVID-19 was not yet confirmed in Indonesia, meme content contained mostly humor that was not educative, moreover it seemed to underestimate the coronavirus. Meme content which is mostly humorous and pornographic occurred when COVID-19 was confirmed in Indonesia and during the lockdown policy. At last, as the government has begun to distribute social assistance, the meme content looks more critical. The results of this research emphasize the urgency of the mass media as a source of public information during the COVID-19 pandemic, become a reference for the community in making memes as a forum for expressing feelings and social criticism, and serve as a reference for the government to act and make the right decisions related to the pandemic that is endemic in their country.

Keywords: COVID-19, content analysis, Indonesia, information, memes, social media

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1. INTRODUCTION

1.1. COVID-19 in Publications and Public Talks

The coronavirus (COVID-19), which was initially discovered by sufferers in December 2019 in Wuhan City, Hubei Province, China (Rothan & Byrareddy, 2020), is one of the major pathogens that primarily targets the human respiratory system and continues to mutate or spread around the world. Data released by Worldometers (2020) recorded 33,361,520 cases of coronavirus that has spread in various countries with a total of 1,003,190 deaths. That data also places the USA as the country with the most coronavirus cases, which amounted to 7,322,391 cases. Meanwhile, Indonesia ranks 23rd with 278,722 cases.

The mutation of COVID-19 in several countries caused various reactions in various fields of life. One of them is the pattern of community communication as part of efforts to obtain and disseminate information related to COVID-19. As a new virus, information about COVID-19 is enough to grab the attention of citizens, so it is not surprising that news about COVID-19 in mainstream media and online media get the highest rank in Indonesia. Until August 2020, news about COVID-19 remained the most popular news in the mass media in Indonesia (Rifai, 2020). The high media attention to the COVID-19 issue shows the high public attention to the coronavirus. Through the mass media people listen to and read, they are able to build awareness of healthy living in the midst of a pandemic (Atarodi et al., 2021). This is in line with the assumption of agenda setting theory which states that mass media news is able to direct public awareness to consider important issues that are considered important by the media (Brosius & Weimann, 1996).

COVID-19 is not only reported in mainstream media and online media but also discussed on social media such as Facebook, Twitter, WhatsApp (WA) groups, and other social media. Based on data from Databoks, issues related to COVID-19 were widely discussed on Indonesian social media in the period March 12-23, 2020, in a percentage of 38%. No less than 145 thousand conversations from January-March 2020 were about the coronavirus and 33.7% of the content of those conversations showed positive sentiment (Lidwina, 2020). The high frequency of public conversations about COVID-19 in social media shows that the issue become the public's concern, and they are interested to know about and discuss it. Moreover, information about deaths due to COVID-19 published by the mass media makes individuals feel excessively anxious so that it can cause emotional function disorders such as neuroticism, depression, and psychosomatic disorders (Ahdiany et al., 2017).

1.2. Concept of Memes

There are various ways that people talk about COVID-19. One of them is through WA (Cancelas-Ouviña, 2021) by discussing COVID-19 with colleagues who join the WA group. Discussions about COVID-19 in WA groups often include memes related to actual problems that occur in society. Brodie (2004) mentions that memes are closely related to the process of replicating various information in the human mind, where its existence is related to various social phenomenon. The memes analyzed in this research represent the thoughts of the Indonesian people when they are dealing with the reality of the COVID-19 pandemic and government policies related to it.

Memes have become synonymous with modern society where they are used as the way to express people's thoughts and attitudes towards the reality of life they are facing or things that they want for their future. This is relevant to the views of Cahya and Triputra (2017), who mention memes as a product of popular culture that thrives in modern society. The accumulation of popular culture built on the meme tradition on social media makes memes become a unit of cultural information that has spread on social networks and has gradually evolved into a social phenomenon (Knobel & Lankshear, 2007). In this context, memes do not exist in a social vacuum, but grow and accompany every existing social reality, or what Dawkins (2016) calls a form of cultural transmission in the form of thoughts and ideas that form certain cultural patterns. Therefore, reviewing memes about the COVID-19 pandemic is considered important to get descriptions of people's attitudes, thoughts, and behaviors when they are struggling with the COVID-19 pandemic and several government policies regarding it.

People's thoughts and attitudes related to the COVID-19 pandemic can be revealed from the form of memes they convey. Memes in the form of images that are given text and produce meaning (Nugraha, 2015) became popular because they spread so quickly and were able to inhabit people's minds like a virus (Pusanti & Haryanto, 2015). Memes not only serve as information providers but also serve as a forum for delivering social criticism which is often packaged in the form of humor (Shifman, 2013). Therefore, choosing memes as the focus of this study is considered appropriate to reveal the public's critical attitude towards government policies related to the handling of the COVID-19 pandemic.

1.3. Scope of the Study

The scope of this research study is not only analyzing meme content around COVID-19 from social media (WhatsApp) users but also analyzing the shift in meme content created and shared by social media users in WA groups in three stages of development and handling of the COVID-19 pandemic in Indonesia, namely: the stage before COVID-19 was confirmed, during the lockdown period due to the outbreak of COVID-19, and the stage of distributing COVID-19 social assistance. Based on the two scopes of the study, this research is focused on examining two things: first, a study on the meaning of COVID-19 memes using semiotic analysis from Roland Barthes; and second, reviewing with qualitative analysis about the shifting meme content in relation to information on the development and handling of the COVID-19 pandemic in Indonesia. The results of these two sets of focus of studies are the goals of this research.

In the context of the use of social media, the scope of this research study is different from some other relevant research, such as research on the use of social media as a means of sharing information or news about COVID-19 (Sulistyaningtyas et al., 2020), or research on the use of social media as a source of COVID-19 information (Allington et al., 2020), or research analyzing hoax news about COVID-19 on social media (Rahayu & Sensusiyati, 2020). In contrast to the studies of these researchers, social media in the scope of this study is positioned as a channel of social control for handling the COVID-19 pandemic in Indonesia by using memes.

1.4. Need for the Study

Research on COVID-19 memes from social media users is important to do to map trends in meme content that represent the way people express their thoughts and hearts, or what Nasrullah (2014) calls a way to see the social and cultural phenomena of social media users in cyberspace; or what Cinelli et al. (2020) refer to as a way of mapping community social behavior towards the COVID-19 pandemic. Memes which are usually in the form of comments, imitations, and parodies (Bauckhage, 2021) can be used as indicators in tracking public opinion about an issue that is currently being discussed, like COVID-19. Public opinion about something is also related to issues that are currently happening, especially when the issue is being virally reported by the mass media.

This research found some important things, namely a correlation between the COVID-19 memes from social media users and the development of information on COVID-19 cases in Indonesia; it also mapped and interpreted the meme content of Indonesian netizens about COVID-19 as a representation of their thoughts and consciences in dealing with the COVID-19 pandemic and response of government policies in handling the pandemic, so that practically the results of this research can be used as a reference for the government in responding and formulating appropriate policies in dealing with the COVID-19 pandemic in particular, and other pandemics in general.

2. LITERATURE REVIEW

Meming is one of the means used by a person to respond and convey messages about actual phenomena in their environment. Pandemic phenomena such as the COVID-19 coronavirus have been used as meme content by netizens since the virus that originated in Wuhan, China broke out at the end of 2019. Memes about COVID-19 were created with various purposes and types, such as entertaining and funny memes, criticism of policies handling COVID-19 memes, or just informative memes. The diversity of goals and types of memes is reaffirmed by Nowak (2016) by saying that memes are not only entertaining but also respond to reality and provide information to others.

The informative function of memes in giving messages or public campaign tools in the fight against COVID-19 is illustrated by the results of Msughter's (2020) research, which found that Internet memes are a form of freedom of expression in communication that can be used as a tool to convey messages to the public in the context of fighting COVID-19. If Msughter (2020) finds memes as a form of information to the public to be strong in dealing with COVID-19, this research focuses on seeing memes as a response to information development of COVID-19 in Indonesia conveyed by the mass media and online media. Related to this focus, this research reveals the shifting meme content shared by netizens on WA group social media during the information development of the COVID-19 pandemic.

Memes about COVID-19 are often fulfilled with humorous content in the form of images and narration. According to Shifman (2013), jokes are one of the content types that decorate Internet memes. The presence of humorous content in memes on social media in a pandemic situation such as COVID-19 is considered capable of influencing the public's perspective on the coronavirus, because humor conveyed through memes has reduced feelings of tension and fear (Hussein & Aljamili, 2020). Humor content in memes on social media about CO-

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VID-19 sometimes leads to topics that are pornographic. This can be seen in Dynel's research (2021) which analyzed meme images of types of masks, which included memes with images of some objects/properties that women consider sensitive, such as bras and sanitary napkins. In contrast to the pornographic memes featured in Dynel's research, the pornographic content in the memes found in this study was more directed towards husband and wife sex at home during the lockdown due to the COVID-19 pandemic.

The COVID-19 pandemic that has hit all countries has required each government to formulate appropriate policies in handling it. The phenomenon of government policy in handling COVID-19 has not escaped public discussion and criticism as outlined in memes. Allifiansyah's (2016) study found that memes developed into a new communication style that contained political content and was used as a means to criticize the policies of the state elite. This is evidenced by Nuryana's research (2021) which reveals netizen criticism through memes related to the Indonesian government's lockdown policy. Like the Indonesian people, Indian netizens also use memes as a medium to criticize the lockdown policy announced by the Prime Minister of India, Narendra Modi on March 24, 2020 (Raj & Jayaprakash, 2021). This research not only examines memes related to the government's lockdown policy as carried out by the two studies above but also examines critical memes from netizens related to social assistance and statements by Indonesian government officials and politicians about COVID-19.

This research not only looks at and analyzes memes in general related to COVID-19 but also classifies memes according to the development of information and types of policies issued by the government in handling the COVID-19 pandemic, namely memes that appeared when COVID-19 was not yet confirmed in Indonesia and the government had not issued any policies; memes that circulated during the lockdown policy; and memes that were discussed when the government issued a policy for distributing social assistance during the COVID-19 pandemic. Therefore, this research is more directed to study the dominant meme content that appears in the three stages of the development of the COVID-19 pandemic and the accompanying governmental policies. In this context, this research is different from other efforts, such as Norstrom and Sarna's (2021) research, which only looked at COVID-19 memes during the lockdown period in Poland, or Sebba-Elran's (2021) research which studied COVID-19 memes, especially in the early days of implementing the lockdown policy in Israel.

3. MATERIALS AND METHODS

This research is a qualitative research with a semiotic approach. Preucel (2010) mentions semiotics as a field of study focused on analyzing sign systems and modes of representation used by humans to convey emotions, ideas, and life experiences. Images are one of the sign systems that are studied within the field of semiotics (Barthes, 1968). In the context of this research, the sign system studied is meme images from Indonesian netizens that describe their emotions, thoughts, and life experiences during the COVID-19 pandemic in their country.

3.1. Data Source

The research data comes from memes about COVID-19 sent and commented on by members of two WhatsApp (WA) groups, namely "Pojok NTB" and "S2 Komunikasi 2002." These two WA groups were chosen because they have a high intensity of dialogue about COVID-19 memes. The WA group "Pojok NTB" represents a WA group based in regions with the majority of its members coming from the NTB Province. The WA group "Pojok NTB" was created January 6, 2020 by an admin group named M. Fihiruddin, S.PD. As of August 27, 2021, there were 256 group members. WA Pojok NTB group participants are Indonesian citizens born in the NTB area who live in various regencies and cities in the NTB Province, and several cities in Indonesia such as the City of Jakarta, the City of Bandung, West Java, and the City of Denpasar Bali. They come from various professional backgrounds, such as the Governor of NTB, Regents in the Province of NTB, members of the legislature, politicians, businessmen, lecturers, teachers, activists of non-government organizations (NGOs), journalists, and various other professions.

Meanwhile, the WA group "S2 Komunikasi 2002" represents the WA group at the national level, which is the WA group of alumni of the Master of Communication Science Program, Padjadjaran University, Indonesia with members from various provinces in Indonesia. The WA group "S2 Communication 2002" was created by an admin named Dr. Yenrizal, M.Si on April 3, 2017 with 30 members. The majority of group members are lecturers (22 people), two politicians, two businessmen, two NGO activists, and two government employees. They live and work in several areas in Indonesia, such as Jakarta, Bandung, Palembang, Aceh, Riau, Banjarmasin, Mataram, and Kendari.

Even though the researcher is a member of the two WA groups, the researcher still asked for permission openly via chat in the group to retrieve meme documents shared by group members. The COVID-19 memes from the two WA groups were taken from January to June 2020. This time span represents the different developments of COVID-19 in Indonesia, such as before a COVID-19 case was confirmed in Indonesia, when an Indonesian citizen was first confirmed with COVID-19 (including during the polemic about lockdown policies), and while the government is distributing social assistance to residents impacted by COVID-19.

3.2. Data Collection & Analysis

The initial step in the data collection process was to observe and collect all the COVID-19 memes that appeared in the two WA groups that were the source of the research data. At this stage there are 40 memes collected. To ensure the correctness and the suitability of the collected memes, data validation is carried out by ensuring that those memes are related to COVID-19 and they are the same as the meme images circulating on online media and other social media. All memes which have been validated are classified based on three time spans of meme emergence, namely; first, COVID-19 memes that were shared in the January-February 2020 range (in the period before COVID-19 was confirmed in Indonesia); second, COVID-19 memes that were shared in the March-April 2020 range (during the COVID-19 outbreak and the lockdown policy); and third, COVID-19 memes that were shared in the May-June 2020 range (during the distribution of COVID-19 social assistance). The three classifications of meme data are sorted and marked with different codes so they do not get mixed up. Furthermore, in each classification, memes that often appear and have been discussed for a long time in the two WA groups are identified as sources of research data. With criteria like these, three memes were found in each stage of development and handling of COVID-19 in Indonesia. These nine memes are then used as objects of study in this study.

Data were analyzed qualitatively with two analytical processes. The first analysis used Roland Barthes' semiotic analysis model, which focused on three units of analysis, namely analyzing denotative meaning, connotation, and the myth of each meme studied in this research. The inclusion of connotative and mythical meaning analysis in Barthes' model according to Sobur (2013) is inseparable from Barthes's thinking that language is a sign system that reflects the assumptions of a particular society at a certain time. The second qualitative analysis was carried out by linking memes with the stages of development and handling of COVID-19 in Indonesia, and also analyzed using relevant concepts and theories. With this kind of analysis, the meaning of COVID-19 memes is found in Indonesia and the trend of shifting meme content is revealed in relation to the three stages of development and handling of the COVID-19 pandemic in Indonesia. The results of the research are validated in two ways; *first*, by diligently re-examining all existing data; this way is done by re-checking the suitability of the data based on the code that has been given and ensuring that the nine meme images that have been selected as research samples have been analyzed according to the semiotic analysis model of Barthes. *Second*, by discussing with colleagues, it helps authors to check the suitability of the data presented with the research focus, discuss the results of data analysis, and provide other useful inputs to get more perfect results from this research.

4. RESULTS AND DISCUSSION

This research identifies three stages of Indonesian netizens' conversations about COVID-19, namely; (a) the stage before COVID-19 was confirmed in Indonesia; (b) the stage when the coronavirus was confirmed and spread in Indonesia; and (c) the stage of the policy for the distribution of COVID-19 social assistance. In each stage of the conversation, a correlation was found between the development of information on COVID-19 and the meme content written and discussed by Indonesian netizens. The meme trend shared by netizens in the three stages of the conversation is also different. The following describes the types and trends of memes from Indonesian netizens in the three stages of conversation about COVID-19.

4.1. Memes Before COVID-19 Confirmed in Indonesia

The discussion about the COVID-19 pandemic in Indonesia had begun before it was confirmed that there were Indonesian Citizens (WNI) who were confirmed to have COVID-19. At this time, information about COVID-19 from the mass media was still reporting about cases of COVID-19 in Wuhan, China and in several countries that had started being attacked by COVID-19. Memes that appear at this time show the attitude of the Indonesian people who are not yet worried about the coronavirus and even make the issue of COVID-19 into joke content. This phenomenon was raised by Indonesian netizens through memes (see Fig. 1).

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The meme as seen in Fig. 1 was posted by a member of the WA group "Pojok NTB" to insinuate Indonesian public officials and politicians who are not serious or do not show concern about the coronavirus. The meme quoted a statement from a member of the House of Representatives (Ribka Tjiptaning), who called the coronavirus an acronym for "*Komunitas Rondo Mempesona*," a joke from the Minister of Transportation who said "We are immune to corona because we like to eat *nasi kucing*" (a small portion of special rice in Yogyakarta). A joke about the coronavirus was also conveyed by the head of the Investment Coordinating Board, Bahlil Lahadalia, who said, "The coronavirus did not enter Indonesia because the permit was difficult." The Minister of Health, Terawan, also joked by saying that the power of prayer prevents the coronavirus from entering Indonesia.

In addition to the denotative meaning as described above, the meme in Fig. 1 has a connotative meaning which is to show that officials in Indonesia still take COVID-19 lightly and they do not show any concern about the outbreak of the COVID-19 in Indonesia, and they (Indonesian officials) even use COVID-19 information as a joke. The meme above contains a myth that something that does not look real is not taken seriously, so it is used as a joke.

In addition to showing memes in the form of a collection of funny statements from Indonesian officials and politicians, netizens also posted funny memes about the coronavirus by displaying images of the SpongeBob cartoon character along with hilarious dialogues related to the coronavirus (Fig. 2). The dialogue shown in the meme is a conversation between a doctor played by Patrick and a patient played by SpongeBob. The funny dialogues of these two cartoon characters link the coronavirus with Chinese mobile phone brands.

The contents of the funny dialogue between SpongeBob and Patrick quoted by the meme shared in the WA group "Pojok NTB" can be quoted as follows:

SpongeBob:	So I got the coronavirus, doctor? What's the reason, doctor? I'm not Chinese, I'm not Chinese either.
Patrick:	By the way, the doctor wants to ask, what's the brand of your cellphone?
SpongeBob:	My HP brand is Xiaomi. Why, doctor?
Patrick:	Well, that's the reason. All cellphones made in China must have the virus.

In addition to the denotative meaning as described above, the meme which adopts the funny dialogue of the cartoon characters SpongeBob and Patrick has a connotative meaning. The meme maker wants to remind netizens to be careful with Chinese products because they have the potential to spread the coronavirus. The meme maker's concern is quite reasonable because the coronavirus that has spread around the world was first discovered in Wuhan City, China. Another connotative meaning of the meme is that the meme maker shows his sentiments towards Chinese products (especially the cell phone brand Xiaomi) by associating one of the mobile phone brands

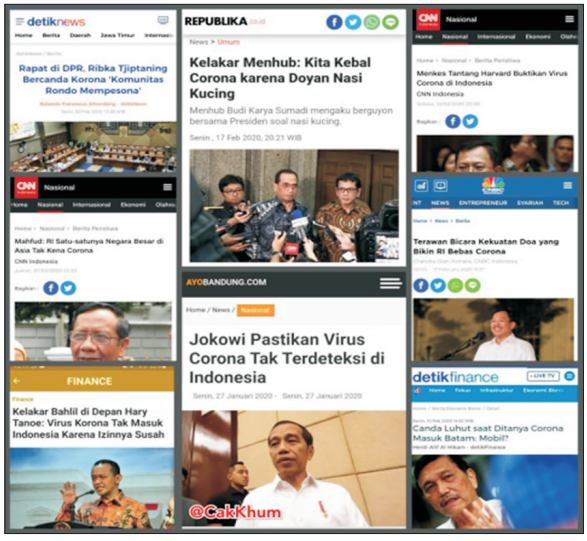


Fig. 1. Meme collection of statements by Indonesian officials and politicians about coronavirus.



Fig. 2. Coronavirus meme using SpongeBob cartoon character.

from China with the coronavirus that is currently endemic. The meme also has the potential to re-strengthen earlier myths related to the negative perceptions of Indonesians about China, such as being the source country of communist ideology that had instigated a rebellion in Indonesia, and being a supplier of labor in Indonesia that pushed indigenous people out of the way.

If in Fig. 2 netizens make funny memes by making dialogue between SpongeBob and Patrick cartoon characters, the meme in Fig. 3 uses funny memes by linking the coronavirus with the Toyota Corona car brand. Denotatively, the meme that was shared in the "S2 Komunikasi 2002" WA group used marketing language that wanted to quickly sell an old 1973 Toyota Corona car on the grounds that it felt slandered as a virus spreader. The connotative meaning of the meme in Fig. 3 is that the meme maker is using the word "corona" as the name of the virus that is being discussed by the world community to promote the Corona car brand (one of the car models produced by Toyota) to the public.

The three pictures above are memes related to the coronavirus that were shared and discussed in the WA groups "Pojok NTB" and "S2 Komunikasi 2002" when the virus had not been confirmed in Indonesia. The three meme images show a relaxed response to the deadly virus. The memes do not show the concern of Indonesian netizens about the dangers of the virus. They made the information about COVID-19 into a joke by adopting a cute cartoon character (SpongeBob), showing pictures of cars branded "corona," and taking photos of Indonesian figures and politicians along with their "not serious" statements about the coronavirus.

4.2. Memes When COVID-19 Was Confirmed and Spread in Indonesia

When President Joko Widodo announced the existence of an Indonesian citizen who was confirmed to have contracted COVID-19 on March 1, 2020, social media in Indonesia was enlivened by discussions about how the government and the community could face or overcome COVID-19. One of the dominant topics of conversation on social media was related to the lockdown policy. According to Lidwina (2020), during the period March 12-23, 2020, the lockdown (regional/country quarantine) became the most discussed issue, namely 38% of discourse.

Netizens continued to consistently use memes as a way to express the condition of COVID-19 when the virus was confirmed in Indonesia. Memes at this time were more related to the lockdown policy. From 15 memes shared in the WA group "Pojok NTB" during March to April 2020, 11 of them were memes related to the lockdown. The dominance of memes about the lockdown policy was also seen in the WA group "S2 Komunikasi 2002," which found seven out of 10 types of memes about lockdown that were shared and discussed in the WA group.

From all types of memes related to the lockdown, three memes have been discussed for a relatively long time by the WA group. The three memes all contain pornographic elements that are packed with funny language. In Fig. 4, for example, a meme is shared with a picture of a housewife leaning on the sofa in a drunken state because she has a craving for lingerie. This meme image is equipped with a pornographic sentence, namely "Due to husband working at home" then followed by the sentence "Open laptop once, open negligee 3 times a day." The sentence is also the denotative meaning of the meme.



Fig. 3. Coronavirus meme using car brands.



Fig. 4. Craving housewife meme.

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This meme was discussed more intensely in the WA group "S2 Komunikasi 2002" than in the WA group "Pojok NTB." Even though this meme contains pornographic sentences, it has an academic element because it includes the sentence "open laptop," so that discussions in WA groups consisting of academics such as those in the "S2 Komunikasi 2002" group look more connected. The meme in Fig. 4 has a connotative meaning in that the togetherness between a husband and wife who are constantly at home during the lockdown due to the COVID-19 pandemic makes the frequency of sex between them increase. The word "open negligee" in the meme (Fig. 4) is connotatively interpreted as "sex," so the word "open negligee 3 times a day" can be interpreted as having sex three times a day.

The meme in Fig. 4 also contains a connotative meaning that contains an allusion to the lack of productivity of husband and wife during the lockdown period. The word "open laptop" connotes work and productivity to get money and materials, so the meme contains a connotative meaning that productive work (which is analogous with "opening laptop") is less frequent (once) compared to sex (3 times), which is identical with activities to get pleasure and enjoyment (not activities to get money and materials).

The meme related to the lockdown in Fig. 5 is more pornographic than the meme in Fig. 4. The meme in Fig. 5 is more intensely discussed in the WA group "Pojok NTB" with various comments, in contrast to the minimal response from members of the WA group "S2 Komunikasi 2002" when the same meme (meme Fig. 5) was shared by a member of the alumni group of the Communication Masters Program at Padjadjaran University.



Fig. 5. Meme of young mother who just came out of the bathroom.

The meme in Fig. 5 shows a young mother walking from the bathroom wearing a towel while saying "the risk of a man staying at home, taking a bath 4 times a day," followed by the sentence below "Lock Down Lurrrr." In addition to this denotative meaning, the meme in Fig. 5 also has a conotative meaning that the lockdown policy has caused the husband to always stay at home and the frequency of having sex to increase (four times a day). The word "bath" in the meme has a relationship with sexual activity, so the woman in the figure is connoted as a wife who has just finished taking a *junub*/obligatory bath (in Islamic teachings) after having sex with her husband.

The memes seen in Figs. 4 and 5 contain myths surrounding the phenomenon of sex between husband and wife, where the man (husband) is always positioned as the party who has hegemony in sex, such as determining the time and frequency of sex. It has become a common understanding and tradition in society that it is normal for the husband to be the initiator in sex, and a wife does not have the power to refuse; rejection of sexual invitations from her husband is not allowed according to Islamic teachings, as the words of the Prophet Muhammad saw as following:

> Abu Hurairah said, Rasulullah SAW said, "If a husband invites his wife to have sex, but she (the wife) does not fulfill her husband's invitation, until that night her husband is angry, then she (the wife) gets the curse of the angels until dawn." (HR Muslim)

The sentences in the meme (memes of Figs. 4 and 5) explicitly show the hegemony of men in terms of sex between husband and wife. The husband is always positioned as the dominant party in determining the pattern of sex with his wife. Therefore, the two memes emphasize the myth that mentions the dominance of men (husbands) in matters of sex between husband and wife.

Memes related to the lockdown policy were also expressed by netizens in the form of cartoons. This can be seen in the discussion of members of the WA group "Pojok NTB." One of the members of the WA group shared a meme in the form of a cartoon featuring Indonesia's dangdut singer, Rhoma Irama, with his partner in the movie *Begadang* (1978), Ani (Fig. 6).

The sentence in the meme (Fig. 6) contains a denotative meaning, namely a dialogue between Rhoma Irama and Ani. Rhoma Irama says, "Don't go out first Ani... Pleasee...," and then Ani answers by saying, "Bulls—t,



Fig. 6. Meme of dangdut singer cartoons and his partner.



Fig. 7. Meme critique of social assistance discrimination.

when you go out first, you usually go to sleep...." Rhoma Irama's statement in this meme can be related to the lockdown situation because it forbids going out. But by analyzing Ani's answer, this meme may be connotatively considered pornographic, because these answers are words that are usually spoken by wives when having sex with their husbands, or based on the experience of husband and wife who are tired and sleep soundly after having sex. Thus, the word "come out" written in the meme is no longer interpreted as leaving the house during the lockdown policy but connotatively means releasing semen during sex.

The meme in Fig. 6 also negates the myth or common sense understanding of society about the power between husband and wife in having sex. The meme shows that husbands are considered "weak" in sex because they are said to be the party who gave up first, or their semen came out first so that the sexual activity ended and the husband fell fast asleep afterwards. The sentences in this meme are considered relevant to the myth that people understand (especially those who are married) that women (wives) are stronger and more durable in having sex than men (husbands).

4.3. Memes During the Distribution of COVID-19 Social Assistance

When the COVID-19 pandemic did not show any sign of ending after being endemic for approximately four months in Indonesia, many people became economically affected. The governments in central, provincial, and district levels began to distribute social assistance to the community. Mainstream mass media and online media also shared the agenda for distributing social assistance to victims of COVID-19. During May to June 2020, the headlines of national newspapers were dominated by news about social assistance. The *Republika Daily*, for example, published a news story with the title "Kemensos allocates cash social assistance for 50,234 families in Karawang" on May 17, 2020, and the June 4, 2020 edition of the *Kompas Daily* lowered the headline with the title "Social assistance is complicated because of data."

The intensity of the publication of the COVID-19 social assistance on mass media and online media was in line with the hectic public discussion about the same thing on social media. There are at least three types of memes about COVID-19 social assistance that are shared and intensely discussed in the WA group "Pojok NTB" and "S2 Komunikasi 2002." The three memes contain criticisms of the implementation of COVID-19 social assistance, but with different images and sentences. The meme in Fig. 7, for example, contains criticism of discrimination in the distribution of social assistance by the government by using caricatures.

The cartoon meme shown in Fig. 7 shows a dialogue between a mother and her child. The mother asks her son, "Where are you going?" and the son answers, "I want to pick up groceries." In the following picture the child is shown walking home. Seeing her child return home without carrying groceries, the mother asks again, "Why did you come back again?" The child answers this question by saying, "I forgot that the head of the Neighborhood Association (RT) is not our relative." The meme not only has a denotative meaning as described above but also has a certain connotative meaning. Connotatively, the meme in Fig. 7 criticizes the practice of nepotism carried out by

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the apparatus at the neighborhood association level in determining the recipients of social assistance by prioritizing their own family members.

Another critical meme about COVID-19 social assistance was also conveyed by showing a figure of a person expressing his frustration by covering his face with the palm of his hand, with fingers full of gold rings (Fig. 8). Denotatively, the meme contains the meaning of someone who is confused because they do not get basic necessities while saying "I'm really dizzy because until now I haven't gotten groceries."

Connotatively, the meme in Fig. 8 implies criticism from social media users in Indonesia against the behavior of unscrupulous people who always expect help even though their economic condition is very well established. The meme also implies that the greedy attitude of the community contributes to the mistargeting of the distribution of social assistance. That is, the occurrence of mistargeting in the distribution of social assistance is not only caused by the attitude of discrimination and nepotism from government officials as distributors, but also because of the greedy attitude of the community as recipients.

The memes in Figs. 7 and 8 negate community myths surrounding the issue of social assistance, which are not far from discriminatory and mistargeted practices. Therefore, it can be said that the two memes represent public perceptions and judgements about implementation of the distribution of social assistance that is not on target. The survey of Saiful Mujani Research and Consulting in 2020, for example, stated that 49 percent of respondents assessed that social assistance from the government for overcoming the impact of the COVID-19 pandemic was still not on target (Saputri, 2020).

Netizen criticism grew louder when a corruption case of the COVID-19 social assistance fund was discovered involving the Minister of Social Affairs of the Republic of Indonesia, Juliari Batubara (Fig. 9). The meme features a photo of the Minister of Social Affairs handing a social assistance package to a mother, accompanied by the text of the minister's words, "Excuse me ma'am, this is a little help for you, but I cut it off *ceban*." This meme uses the word "*ceban*" (Mandarin) which means "ten thousand." Denotatively, this meme informs about the distribution of basic food assistance activities carried out by the Minister of Social Affairs and the minister's statement that he skimmed off some of the assistance.

This meme was intensely discussed in two WA groups (Pojok NTB and S2 Komunikasi 2002) when the Social Affairs Minister, Juliari Batubara, reported corruption in social assistance funds. News about this had gone viral in mainstream media and online media in early December 2020. The meme in Fig. 9 has a connotative meaning in the form of satire and criticism of the Minister of Social Affairs, who since that December 6 has been designated by the Corruption Eradication Commission as a corruption suspect of COVID-19 social assistance. The corruption carried out by the Minister of Social Affairs towards the COVID-19 social assistance funds made the public's perception of corruption committed by government officials increasingly confirmed. The Global Corruption Barometer survey compiled by Transparency International in 2017 shows that 50 percent of the public considers government officials to be involved in corruption (Lokadata, 2017).



Fig. 8. Meme critique of rich people who hope for COVID-19 social assistance.



Fig. 9. Meme of satire and criticism of the Minister of Social Affairs.

4.4. Shifting Content of COVID-19 Memes: From Jokes to Pornography and Criticisms

There are three typologies of meme content submitted by Indonesian netizens related to the COVID-19 pandemic. The three typologies are shown at different times. In the early days before the coronavirus entered Indonesia, Indonesian netizens' memes were more dominated by funny meme content, while when the coronavirus was confirmed and spread in Indonesia, netizens' memes were dominated by pornographic content. And in the period of distributing social assistance to residents affected by the coronavirus, netizens made critical memes. It can be seen in Table 1.

The three typologies of meme content which are a form of public response to the development of information on COVID-19 in Indonesia found in this research reflect the character of social communication in the era of communication technology development. In the context of social communication, memes around COVID-19 are a form of implementing expressive functions in communication that are carried out by a person or group of people (Mulyana, 2018). The freedom of expression of the Indonesian people through memes is supported by the existence of government regulations and policies that provide space for freedom of expression for every citizen. However, it would be better if the energy of freedom of expression were channeled in a direction that is more contributive to social life. The results of this research find that not all memes made by Indonesian netizens contribute positively to social life because there are still memes that contain pornographic and funny content without social criticism.

Funny memes are inevitable, and humor has even become synonymous with memes. Memes created when the COVID-19 pandemic had not yet entered Indonesia, and during the COVID-19 lockdown period, were colored with funny and pornographic memes. This fact meets the criteria for memes which contain phrases that are generally applied to describe propaganda on content such as jokes, rumors, videos, or websites from one person to another via the Internet (Shifman, 2013). The appearance of funny memes during the COVID-19 pandemic has contributed to reducing fear and anxiety. The research results of Hussein and Aljamili (2020) show that humorous memes on social media affect the public's perspective on coronavirus because humorous content conveyed through memes will relieve tension and fear.

This research not only found funny memes about COVID-19 but also funny/humorous memes that lead to taboo things to talk about, because they are related to husband and wife relationships such as sex. The porn-humorous meme content conveyed is not directly related to the reality of COVID-19. This meme phenomenon further emphasizes the existence of humor which is built from two or more unrelated contextual associations (Koestler, 1964). This has implications for the inclusion of issues that are not commonly discussed or are taboo in humor, so that humor is able to infuse taboo themes while still being acceptable to the public (Gilbert, 2004; Lee et al., 2017; Ruch, 2008).

The emergence of memes containing pornographic content during the COVID-19 pandemic lockdown is predicted to be related to the amount of free time that everyone has while at home. As it is known, the lockdown policy has stopped everyone's activities outside the home (including at the office) so that they automatically stay at home for a long time. If the free time cannot be filled with positive activities, it is very possible that negative activities such as making memes with porn content are carried out by someone. The results of Novita's research (2018) on the habits of teenagers regarding watching pornographic films are considered relevant to explain the phenomenon of memes with porn content on social media. One of the reasons why teenagers watch pornographic films according to Novita's research is because there is a lot of free time that is not used by someone with positive activities.

Publication and discussion of pornographic COVID-19 memes conducted by Indonesian netizens is very unfortunate, because ideally in the atmosphere of the ongoing COVID-19 pandemic, public participation is needed by sharing meme content on social media that strengthens the spirit of resistance against the coronavirus. Indonesian netizens have a lot to learn from the Nigerian community in using Internet memes during the COVID-19 pandemic. Nigerians create Internet memes containing content against the coronavirus with creative

Table 1. The shifting of meme content in three stages of development and handling of COVID-19 in Indonesia

Stages of development and handling of COVID-19	Content and types of meme
1. Before COVID-19 confirmed in Indonesia	Funny memes
2. When COVID-19 was confirmed in Indonesia and lockdown policy applied	Porn memes
3. COVID-19 social assistance distribution period	Critical memes

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and educational images and sentences, as a form of their awareness of the dangers of COVID-19 as well as regarding their participation in fighting the virus originating from Wuhan, China (Msughter, 2020). The use of memes with positive content to fight the spread of COVID-19 in their respective countries is also carried out by the people of Malaysia and Singapore (Abidin, 2020). However, it does not mean that pornographic memes are not contributing to society during the pandemic. At least by reading and viewing pornographic memes related to COVID-19, people can ease tensions and eliminate fear amid the threat of the COVID-19 pandemic that is endemic in their area.

One of the positive aspects of memes related to the COVID-19 pandemic found in this research is memes that contain social criticism content. Meme content that contains social criticism from netizens during the distribution of COVID-19 social assistance is a form of community participation by criticizing policies made by government institutions when facing certain issues (Widiastuti et al., 2020), as part of the function of memes as a forum for channeling social criticism (Nasrullah & Rustandi, 2016; Shifman, 2013; Widiastuti et al., 2020). In the context of this research, critical memes submitted by netizens or members of the WA group are carried out to criticize every policy or attitude and opinion of the authorities in handling the COVID-19 pandemic in Indonesia. The findings of this research are relevant to the study of Allifiansyah (2016), which found that memes developed into a new communication style capable of containing political content or a means to criticize the policies of the state elite. Therefore, the results of this research can serve as a warning to every government official not to ignore the pandemic even though it was not confirmed in Indonesia at that time. The momentum before the outbreak of the COVID-19 pandemic should have been used as a serious effort to take preventive steps, not belittled with jokes and funny words. The results of this research are also a strong warning for officials not to skim social assistance for victims of pandemics (or other disasters in general) and become a reference for the government to make regulations that are able to minimize the occurrence of corruption in the distribution of social assistance.

This research not only reveals three typologies of meme content related to COVID-19 in Indonesia, but also finds a correlation between news content about COVID-19 from mainstream and online mass media and the choice of meme content shared and discussed by netizens, especially members of the WA group. This data confirms the assumptions of the Agenda Setting theory/model proposed by McCombs and Shaw (as cited in Effendy, 2003, p. 287). According to this model, if the media puts pressure on an event, then the media will influence the audience to consider it important. Memes that are shared and discussed in WA media groups are a form of response from social media users to developments that occur in their environment, or current and hot issues published in the mass media and online. This is reinforced by the similarities between the meme content that is shared and discussed with issues related to COVID-19 that are currently being published by mass media.

The mass media as a provider of information about events in society and the world (McQuail, 2003) have been used by the public as a reference related to the development of COVID-19. Information about COVID-19 from the mass media is included in the category of emergency information and is urgently needed by the public. Research by Zhang et al. (2017) found that there was a fast response from social media users to health emergency information from the mass media. The findings above are relevant to the research results of Nielsen Television Audience Measurement (Lubis, 2020) which found an increasing number of television viewers in Indonesia since COVID-19 was confirmed in the country. The public's need for information on COVID-19 makes them rely on mass media news. This assumption is emphasized in the dependency theory of mass communication effects, which explains that the more people rely on something that needs to be fulfilled by using media, the more important is the role of media in one's life (Baran & Davis, 2010). The theoretical assumptions above confirm the results of this research which found a correlation between information on the development of COVID-19 from the mass media and meme content produced and shared by the public on social media.

5. CONCLUSIONS AND IMPLICATIONS

The shift in meme content related to COVID-19 shared by netizens on social media correlates with the development of COVID-19 in Indonesia, which is supported by impressions of information through mass media reports and online media. In Indonesia, people make funny memes joking about officials with the impression of disparaging them, without showing concern about the dangers of the coronavirus. People also make memes containing humor that link the coronavirus with things that seem Chinese. When the mass media intensively re-

ported on the lockdown policy after the coronavirus was confirmed in Indonesia, people were aggressively creating porn-content memes related to husband and wife sex during the lockdown process. Likewise, when the corruption case of the COVID-19 social assistance fund went viral in the mass media, the public also made critical memes as a form of their protest against the unfair distribution of basic necessities and the behavior of officials involved in the corruption of the COVID-19 social assistance fund.

Information about the COVID-19 pandemic from mass media and online media is not only used as a source of knowledge and reference in responding to the health emergency situation during the pandemic, but also as a reference and inspiration in conducting social criticism through memes. This finding further strengthens the assumption of the agenda setting theory, which states that the mass media has the power to influence its audience so that they also consider the importance of an agenda that is set or considered important by the mass media.

One of the limitations of this research is the limited number of memes analyzed (only nine memes) and the limited number of WA groups studied (only two WA groups) so that they cannot represent all the thoughts and consciences of the Indonesian people at every stage of development in handling COVID-19 in the country. Nevertheless, the results of this research at least provide an overview of people's thoughts and feelings (which are expressed in the form of memes on social media) regarding the handling of the COVID-19 pandemic in Indonesia, because the nine memes selected are memes that are dominantly circulating on social media, and two WA groups represent national and regional scales. Critical memes about handling COVID-19 in Indonesia revealed in this research can be a lesson for the public, politicians, and government officials to be more precise in giving statements, acting, and making policies when responding to and dealing with pandemics such as COVID-19, which is endemic in Indonesia. Therefore, this research is expected to have implications for the formulation of appropriate policies and the availability of strong human resources in handling COVID-19 particularly, and other pandemics in Indonesia generally.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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Using Ontology to Represent Cultural Aspects of Local Products for Supporting Local Community Enterprise in Thailand

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ABSTRACT

Community enterprise plays an important role for developing local business. Products from local communities apply local specialties such as high-quality materials and inherited wisdom. This work aims to support merchandises from local community enterprises by bringing out their specialties related to local wisdom and intangible cultural aspects. An ontology is applied to demonstrate the innate information regarding the implicit values of the products and is used as a core for a semantic search system. Details of the products are gathered from their respective community using an interview method and are extracted to align with the developed ontological schema. The semantic search system thus is implemented with a recommendation process for online accessibility for providing the organised information. From evaluation, the developed ontology and its instances are rated highly for their consistency, conciseness, and completeness. In usage, accuracy of the query and recommendation results are evaluated at 97.38% searching accuracy and 85.03% for recommending interesting products.

Keywords: community enterprise, intangible culture, local product, ontology, knowledge graph

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1. INTRODUCTION

Local businesses play a crucial role in a country since they provide jobs for neighbours and strengthen bonds in a community (Edmiston, 2007). Local small enterprises take root to a landscape where their community is and bring growth to local economies, for they normally use local materials and manpower (Robinson & LaMore, 2010). Although the benefit of such businesses is low, they are essential to a community for contributing meaningful drive in community growth. Furthermore, local businesses often apply inherited wisdom to increase the value of their product to become uniquely outstanding in terms of quality instead of quantity.

In Thailand, small local businesses formed in a community referred as Community Enterprise (CE) have been supported by the Community Enterprise Promotion Division under the Department of Agricultural Extension, Ministry of Agriculture and Cooperatives since 2005 (Community Enterprise Promotion Division, 2012). With the support from government agencies, many CEs have been legally registered and drive their community towards the world of business. In comparison, large business may have an advantage over CE in terms of funds for advertising and share in a market, but CE features local specialties which cannot be accomplished via mass production of large businesses. Thus, it is important to demonstrate local specialties of CE when it comes to supporting CE business. However, noticeable disadvantages of CE such as mass-advertising and accessibility still remain, and these issues should be managed for CE to become successful.

With the latest information and communication technology, information can be digitally accessed via the Internet. This technology can resolve the issues of accessibility challenges for CE. There are many Information Technology (IT) works to assist business such as electronic catalogues (e-catalogues) for browsing products online (Xu et al., 2009), product search engines, product recommendation systems (Thotharat, 2017), and platforms for online stores including Amazon, Lazada, and Shoppee. For Thai local products, supporting systems (Thotharat, 2017) have also been invented, especially searching systems towards OTOP, which stands for 'One Tumbon One Product,' referring to highlighted products selected from each Thai subdistrict (Tumbon) community. These online applications, however, focus on providing product information and basic details of a product such as price, size, and reviews from buyers as well as providing a channel to contact product providers and the transaction process. CE products thus may pale in comparison since they cannot fully display their specialties from inherited local wisdom. Moreover, the existing online platforms requires business owners to self-handle the product information, while many CE owners are technology-challenged and may not be able to adapt to such technologies.

In fact, CE products have their own outstanding values in terms of cultural representation features. Since the products are made using inherited local wisdom, they are rather unique as opposed to mass products. The wisdom for production includes how to select materials from local sources, properties of the material, manufacturing expertise, and refinement of the product. This wisdom is a local wisdom inherited from generations in a local lineage, since it is related to local materials and crafting methods that have special attributes and may not be found elsewhere. For example, some locals are renowned for their stone having extra sturdiness and use it as material for a product with some inherited techniques, resulting in a more durable houseware comparing to similar products in the market. Furthermore, the products can also be related to local folklore and represent spiritual supports such as charms for health and luck and talismans for protection. These cultural aspects are invaluable features that cannot be replicated in mass products. These attributes can be imprinted in a CE product in various ways of manifestation. Some products such as houseware may show higher quality in terms of durability from local knowledge of choosing proper materials known to be special and using secret inherited manufacturing techniques, or this may include drawing patterns bringing luck according to local folklore. Thus it is necessary to use these cultural aspects to advertise CE products.

This work hence aims to develop an ontology to represent the network of concepts regarding cultural aspects manifested in CE products to feature their specialties in terms of their relation with intangible culture, including tradition, belief, knowledge, and skill. The ontology and the product information collected from CE are thus used in an e-catalogue which has a function to search and recommend products based on the given cultural aspects following the ontology structures. We expect that this will help to bring out the tacit specialties of community products and improve their business opportunity to a larger scale of economy. The rest of the paper is organised as follows. Section 2 provides background knowledge related to the design of the proposed system and related work. Section 3 gives a design and development of the proposed system. Evaluation and results are described in Section 4.

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Section 5 gives a conclusion and remarks regarding this research.

2. BACKGROUNDS

2.1. Ontology Representation

Ontology is one of the knowledge representation structures representing the explicit formal specifications of terms in the domain and relations among them (Gruber, 1995; Mizoguchi, 2003). An ontology defines a common vocabulary for users who need to share information in a domain (Noy & McGuinness, 2001). For usage, an ontology provides machine-interpretable definitions of concepts in the domain and relations. Hence, ontology schemas become a good resource to represent a network of concepts as a knowledge base to enhance IT with real-world knowledge among things in relevant domains (Ruangrajitpakorn et al., 2018).

In ontology, a schema of concepts in a domain as a set of classes is constructed and related to each other by a relation. Types of relation are as follows:

- Is-a relation: This relation forms a hypernym-hyponym (supertype-subtype) relationship between concepts to define a taxonomic hierarchy. As a taxonomic hierarchical structure, all qualifications of a supertype must inherit into its subtype.
- Property relation: This relation forms a holonym-meronym (whole-part) relationship to define a possession or composition. For linking a concept with other concepts, Object property or Part-of (P/o) is called while Data property or Attribute-of (A/o) is used to mention a link between a concept and data.

With these relations, concepts are linked to each other with a specification and semantic constraint. Ontology is given in a computational logic-based language called OWL (web ontology language) designed by W3C (McGuinness & van Harmelen, 2004). OWL is built upon a W3C XML standard for objects called the Resource Description Framework (de Bruijn & Welty, 2013). It is designed to represent rich and complex knowledge as a base for a machine to interpret and understand knowledge of things and their relations.

2.2. Cultural Aspects

Culture is a term with several meanings, but in this work we summarily refer to the term as "the shared thought, behavior and schemes created by a group of people to explicitly and implicitly perceive, interpret, express, and respond to the people around them" (Banks & McGee, 1989; Damen, 1987; Kroeber & Kluckhohn, 1952; Lederach, 1995). Culture is manifested in beliefs, behaviors, and objects in both tangible and intangible forms and become the cultural heritage of the people. According to UNESCO, 'Tangible Cultural Heritage' refers to physical artefacts produced, maintained, and transmitted inter-generationally in a society, while 'Intangible Cultural Heritage' includes oral traditions, performing arts, social practices, rituals, festive events, knowledge, and practices concerning nature and the universe, or the knowledge and skills to produce traditional crafts (UNESCO, 2003). The essence of intangible cultural heritage is the wealth of knowledge and skills that pass down from one generation to the next.

As the community continues, its members gain more experience and knowledge combining to have sound judgement towards procedures as wisdom. Within the passing down of culture, a solid and sound judgement of situations as wisdom of the ancestors is hidden in cultural aspects. Within its tales, the wisdom of a community (local wisdom) may show in the form of a story of legends or folktales to exemplify the situation and hint on what is important. On the other hand, local wisdom can be inherited as secluded knowledge and skills to wisely handle local resources as a specific procedure to produce products. In this work, such products are a manifestation of intangible cultural heritage.

In terms of cultural manifestation, intangible cultural heritage can be crafted into community products showing the tradition, customs, and beliefs of the community in several ways. Since each community has its own culture core from different ethnic, geographical, historical, social connections, inherited knowledge and skill, and profession, these variables can make them uniquely outstanding, and these aspects are implicitly manifested into their way of living and oral expression, as well as in produced goods.

We can group the intangible cultural aspects that are manifested into produced goods into four types, as tradition/custom, belief, knowledge, and skill.

- Tradition/custom: referring to well-known social practices, rituals, tangible heritages, and festive events of the area where the community belongs to. The products may include the use of festive/ritual symbolic items or verbal phrases imprinted into the products such as imitated figurines, or drawings wholly or in part representing a community tradi-

tion. This also includes the characteristics of traditional patterns or designs which are famous in the locality as part of the goods.

- Belief: referring to the stories that the community accepts as virtuous and true, including legends, folklore, and local tales (Tuamsuk et al., 2018). The manifestation of this aspect can be in the form of materializing the characters as human or imaginary creatures (Chansanam et al., 2014), locations and objects appearing in the passed-down story into imitating objects, or as a drawing pattern imprinted on the goods.
- Knowledge: referring to a set of specific knowledge on things related to producing goods, such as knowledge of determining materials and procedures to prepare materials for production. Materials include plant-based and natural materials, living materials, and synthetic materials. The knowledge within the community also includes how to produce the material using local resources based on unique natural qualities as well as inherited herbal medicinal knowledge. The knowledge thus improves the overall quality of the products such as durability of furniture and decorations, artistic quality of accessories and decorations, and taste and preservative quality for consumable goods.
- Skill: referring to a set of specific abilities to perform an action with good execution for certain tasks. The skill is a technical skill involving specific processing and techniques such as craftsmanship and cooking. The skill thus improves the quality of the end products regarding applied techniques which may differentiate the products and others.

The manifested cultural aspects thus are shown as a part of community products. These cultural properties exist but are not focused on or advertised as one of the product's values in common online market platforms. Furthermore, such cultural aspects are implicit and require being explicitly shown since some are not generally known to the public, such as local tales or qualities regarding local materials. These properties, however, can be a selling point of goods from CEs.

2.3. Related Works

There are many works on using IT to support marketing and online markets. The focuses of these works are such as to support and enhance product searching, to personalise user interfaces to match user behavior, and to analyze users' trends to develop new products. For these works, digital data of products and users are crucial as the main input data for a system to decide and manage functions properly. Among many data representations, an ontology is favored to represent a schema of data for its ability to logically relate data as a semantic web (Noy & McGuinness, 2001). An ontology is developed to specify concepts within a domain to assist in explaining data relations based on facts in a real-world aspect. A semantic network model of an ontology and instance data enables logical reasoning and inferences (Pinto et al., 2009), which helps in advance searching and recommendations. Thus we review the recent work related to using an ontology to support marketing and online markets.

Thotharat (2017) proposed a design of an ontology to store information of local products in Thailand. The work focused on OTOP products (One Tambon One Product), which is a program to stimulate local entrepreneurship by the Thai government. The ontology was crafted to represent information of both product and local entrepreneurship for linking product and local area. For concepts related to products, properties are designed to store basic attributes of the products as well as additional defined attributes such as edibility, preservation usage, and packaging. With such properties, the ontology was developed towards the idea of decision-making for users to consider in-depth details in terms of purchasing. The online semantic search was also developed for the ontological information to be retrieved via user interface.

Ontology-Based Recommendation of Editorial Products (Thanapalasingam et al., 2018) is a work using an ontology as a taxonomy of research areas regarding scholarly publications in the field of computer science to recommend articles relevant to a topic of interest. The relevant information from about 16 million scholarly publications in terms of research topic is extracted to match an ontology schema. A similarity of publications based on the research topics is calculated to group similar publications. Since the content is involved in text description, natural language process techniques, including term-frequency and text-similarity, were chosen to handle word occurrence.

Lee et al. (2006) published their work on an ontology-based product recommender system for B2B marketplaces (a digital platform for conducting business with others). The ontology was developed to capture user preference and product information. By matching user preferences and product information, resulting in many possible matches, a Bayesian network was applied to calculate

for probabilistic score, and the score is used to rank the matched items.

Ontology-based recommendation involving consumer product reviews (Baizal et al., 2016) presents a recommender system developed based on the ontology consisting of concepts related to user preference, product feature, and product review. By extending product features with customer review, a review rating of each attached feature of the product is created. The feature with review rate then is calculated to match the user preference for recommendation.

Ontology-Based Sentiment Analysis Model of Customer Reviews for Electronic Products (Sam & Chatwin, 2013) is a research work to develop a method to analyse user sentiment based on review and to design an ontology to schematise information of electronic products and emotions. The sentiment analysis was developed using text-mining techniques to define emotional keywords that match to the concept in the ontology. The system then allows a user to make a query about a type of product with sentimental expressions such as "Which tablet PC is most excellent?" and the information in the ontology is filtered by the product information and assigned sentiment review.

From the review, an ontology representation shows potential as a formal data model for products since it can demonstrate relationships among concepts to represent how concepts are rationally related. Some works include additional concepts that involve objectives such as customer review and user preference. For the task of querying and recommendation, ontologies in these works are used as a core knowledge base to describe a group of product items regarding taxonomy trees or how products are similar based on the designed properties. Unfortunately, additional computational techniques are needed when text information requires handling.

Most of these works focus on applying an ontology schema to enhance search engines and recommendations. Some works use attributes within an ontology to assist in recommending similar products while some use an ontology to collect opinions and reviews for additional features in searching. These works are a showcase of how useful and capable ontology can help in marketing. Since these ontologies are developed specifically to a domain of focused products such as academic publications and electronic products, they are hardly reusable for another type of product with different properties. Thus, it is essential to develop a specific ontology for CE products while related techniques for recommending and querying can be applied to enhance the usage of the ontology for promoting local Thai products.

3. RESEARCH METHODOLOGY

This work is a mix between a study of cultural aspects in local products and innovation. Thus, the research includes gathering information of the local products for analysis and development of a system using the analysed information.

For exploring cultural aspects in local products, we interview the voluntary CEs that own local products to seek insights of the product and cultural/wisdom perspectives, since these details are not well-defined and are given in public as common product details. This data collection was conducted from March 7, 2020 to June 13, 2020 from 67 voluntary CEs in Nonthaburi province with a total of 82 products. The basis of the interview is to ask for details of the product regarding basic information of the products and their specialty related to cultural aspects to fill in a questionnaire. Since the target information is related to culture and beliefs, which is complicated and prone to confuse the informants, we chose the interview format to obtain precise answers to reduce communication error. The interview was conducted via online meetings due to the emerging of COVID-19. Particularly, the interviewer asked about the specialty of the products since the product owner (interviewee) may not know about its cultural aspects. To ascertain the accuracy of the interview, summarised answers are processed and then approved by the interviewee. The topics for asking are as follows.

- Basic information
  - Product name: to define the identity of the product including its brand and locally called name
  - Product type: to group the product based on type of the product
  - Price: to provide a price for the product per unit
  - Manufacturer: to define the identity of the product manufacturer and its contact
- Specialty
  - Cultural aspect: to define how the product relates to local culture and beliefs such as folklore, legend, and local lifestyle
  - Used materials: to define specialties related to used materials with renowned popularity, such as fruit, plants, and other natural materials
  - Manufacturing technique: to define methods to make a product to obtain better attributes than

others in the market

This interview is a task to get the information from CEs about their products that cannot be obtained from observing their products. According to the cultural aspect mentioned in Section 2.2, the collected data on the specialty part are analysed to assign the group of aspect. As there are four aspects, tradition/custom, belief, knowledge, and skill, we map the information to the aspect accordingly. In case of the tradition/custom aspect, the information in this aspect involves known event names of traditional items and traditional dances, such as the tradition name 'ประเพณีตักบาตรดอกไม้' (tradition of offering flowers to a Buddhist monk) and traditional cloth 'ผ้าขาวม้า' (chest-patterned fabric used as loincloths). Such products include a bag using chest-patterned fabrics as materials and a traditional cloth commonly worn in the customary event of offering flowers to a Buddhist monk. For the belief aspect, information related to cultural stories including legends and folklore is categorised in this group. For instance, there is the folklore of a person who freed the eels stuck in the dried canal to receive a blessing of extended life and prevention of accidents. The products involved in the tale such as eel figurines and decorating drawings of the tales are associated into the group. For the knowledge aspect, the specialty of products is related to inherited knowledge of product materials. This aspect involves products that require processing such as foods and processed objects including furniture and decoration. This also includes the use of local materials which are famous for higher quality and better taste. In terms of the skill aspect, the products are related to special techniques such as handicraft techniques and secluded food process methods. The products varied from consumable products to wood and clay sculpting products, knitted clothes, and dyed products. Depending on the information answered by the product owner, it is possible for a CE product to have more than one aspect while some products may not contain such a cultural aspect as they are not related to the inherited wisdom of the community but follow the demand of the market.

From the questions of the interview, we obtain the details of the CE products with their relationships towards cultural aspect concepts or their specialty regarding local materials and inherited manufacturing techniques. For instance, we found a vase product using a local clay as a material which results in more durability and has a drawn pattern representing the divine creature respected in the locality (according to local folklore) to bring luck towards the owner's household. This information then is analysed based on knowledge engineering to develop a knowledge schema to represent product properties in the form of an ontology. The details of the product are allocated in the database field matching the ontology schema. The development of the ontology and the system is explained in the following section.

4. DEVELOPMENT OF SUPPORTING SYSTEM FOR CE

This work focuses on bringing out specialties of products from CE in Thailand. These products are not the latest technological creations, but they are produced from cultural perspectives using passed-down wisdom and culture-related practises. Hence, their values rely on intangible-cultural concepts of creation and are attached with authentic feelings of local specialties. The CE products thus are commonly handmade and become a part of cultural products. In this work, we attempt to extract those implicit specialties and make them their explicit selling points. An ontology is chosen to represent the complex and tacit relations among them, while a semantic search is developed to apply the ontology for supporting an e-catalogue system for CE products. An overview of the system is illustrated in Fig. 1.

Based on Fig. 1, there are four layers: the input layer, storage layer, processing layer, and user-interface layer. The input layer transforms the relevant information including product details, product-related cultural concept, and manufacturing wisdom obtained from the interview into a knowledge base. The storage layer stores the knowledge base in the form of an ontology with the extracted information as ontological instances. With ontology representation, new information can be added, and existing information is allowed to be modified with newfound aspects. The processing layer processes user queries for retrieving the matching result and finding similar products for recommendation. Last, the user-interface layer gets input from users and display results from the processing layer.

4.1. Knowledge Base

4.1.1. Design of Community Enterprise Ontology

The aim of the ontology is to represent relationship between products and their specialties from local materials and local inherited wisdom in regard of CE. Thus, this CE ontology is designed to cover those relevant concepts.

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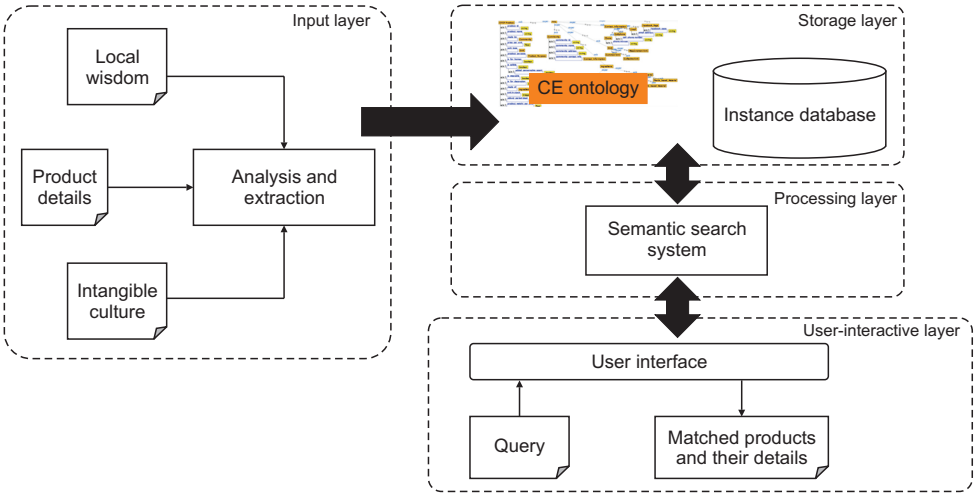


Fig. 1. An overview of supporting system for community enterprise (CE).

To design the ontology schema, we list the relevant concepts in the scope of CE products and their cultural aspect mentioned in Section 2.2. The found relevant concepts include the main concept of *Product*, *Community*, and *Cultural Aspect*. As these concepts are distinct in terms of meaning but are related as part of a relationship, we design the concepts into separated trees. Then, the relations to link the concepts are designed to link the concepts across the trees. As we realise that the *Product* concept is the main concept to represent the core product instance data, the *Product* concept is determined to be the main tree of this ontology, and other concepts are thus logically related to this main tree. At this state, the relations are designed to show the properties of the *Product* concept. Since the *Community* and *Cultural Aspect* concepts are the properties of CE products, as a product is made by a community and a product has a selling point for its cultural aspect, we related the *Product* concept as the domain of relation to the range concept of *Community* and *Cultural Aspect* with a *made_by* relationship and *related_to_cultural_aspect* relatively, respectively. Because the relations are to relate among concepts, the properties are defined as an object property (part-of) relation. As we design further, we found more related data to the *Product* concept (data are not the concept, as they have little to no meaning) including the product name and the price of a product. Such data thus are designed as additional relations for data properties to the *Product* concepts, with the assigned datatypes based on appropriate data for the slot as *string* datatype for name relation and integer *datatype* for price. For the *Community* concept, the concept has its own property since a community commonly has a name, an address, and contact information. Thus, we design the distinct property to represent the relations separately. As address, email address, and name do not give meaning or represent a conceptual entity, they are designed as data with the relationship of a data property (attribute-of) relation to attach to the *Community* concept. For the *Cultural Aspect* tree, we realise that there is another relevant concept as *Quality Aspect* of the product; thus, we design the two aspects together under the more generalised concept of *Selling Point* and link the *Quality Aspect* as another object property with the relation name of *related_to_qualit_aspect* to the main tree *Product*. After this state, related concepts are added to furnish the existing trees for more complete network of related concepts and datatype.

The ontology is the conceptual schema to explain how concepts and specified datatype relate to one another in a given domain of interest based on real-world facts. Thus, the schema does not include the data of the real-world entities which will be instantiated to the concepts with property values following the schema.

As the designed result, the ontology consists of three main concepts, *Product*, *Community*, and *Selling_Point*, while there are several minor concepts such as *Person* and *Manufacturing_Type* to compliment the properties of the main concept. Some of the concepts including *Selling_Point* and *Manufacturing_Type* are represented in a tree to inform taxonomic hierarchy, where a subclass has a type-of relationship to its superclass. Some major concepts of the ontology are illustrated in Fig. 2.

For ontology properties, they help to define the relationships of a concept to other concepts and of concept to data value. We design properties for concepts and exemplify the major properties in Table 1.

For explanation, the core concept of the ontology is the

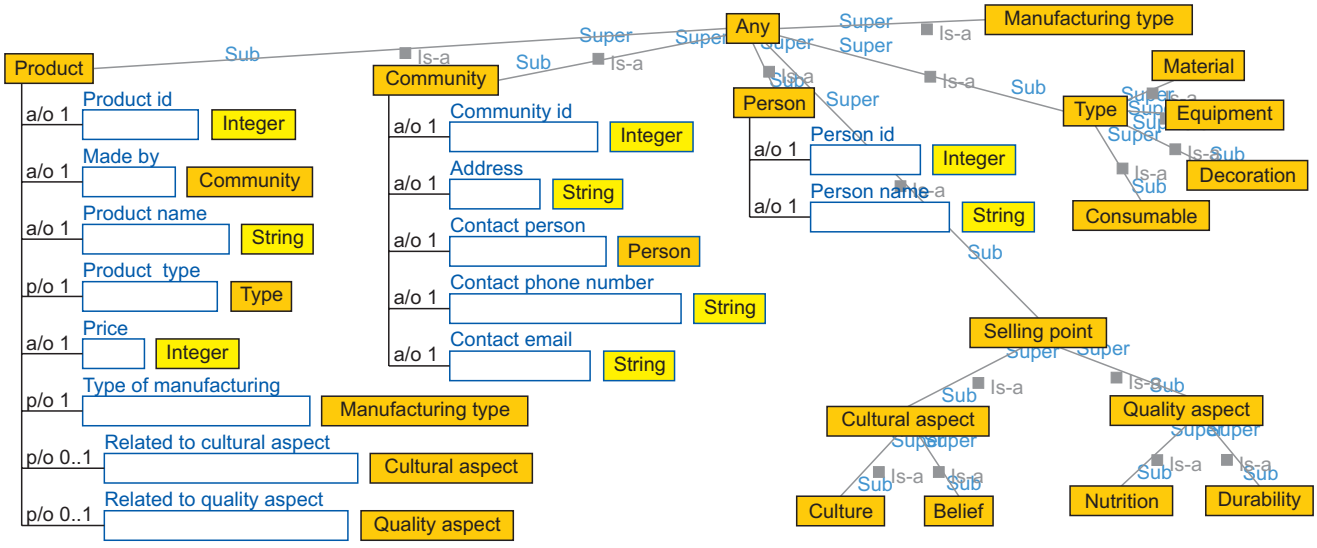


Fig. 2. Main trees of the community enterprise ontology.

Table 1. List of main properties and their specifications

Property	Definition	Specification
Product type	To inform a purposed type of a product	Type • Consumption (such as food, shampoo, and soap) • Equipment (such as cloth and jewellery) • Decoration (such as vase and houseware) • Material (such as clay and brick)
Type of manufacturing	To inform how they make a product	Manufacturing type • Hand-made • Machine
Related to cultural aspect	To inform implicit selling points involved to cultural heritages	Cultural aspect • Culture (specified with an instance of this class such as local tradition and usage) • Belief (specified with an instance of this class such as folklore, and tales)
Related to quality aspect	To inform implicit selling points relevant to how the product having higher quality	Quality aspect • Nutrition (specified with an instance of this class) • Taste (specified with an instance of this class) • Durability (specified with an instance of this class)

concept *Product*, which connects to concept *Community*, *Type*, *Manufacturing_Type*, *Cultural_Aspect*, and *Quality Aspect*. This *Product* concept represents CE product; hence, it directly relates to several kinds of related information as a part-of a product. The relationship between *Product* and *Community* informs which community made the product, while *Manufacturing_Type*, *Cultural_Aspect*, and *Quality Aspect* provide how unique the product is, based on the aspect of manufacturing-related concept, culture-based concept, and quality-based concept, respectively. Other properties of the concept *Product* are the data-property to link the concept to data, including *product id* (for system usage), product *name*, and product *price* per unit. For *Community* there are five properties, which are four data-properties and one object-property. The object-property of the concept *Community* links to a person who is a communicative representative of the community. The data properties are the basic information of a community including address, contact number, and contact email. The concept *Type* which is related to *Product* separates products based on type of product, such as consumable, equipment, and decoration. Last, *Cultural_*

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Aspect and *Quality Aspect*, which are the sub-concepts of *Selling Point*, respectively relate a product to relevant cultural information including specified beliefs, folklore, and lifestyle and link to qualities of local materials and manufacturing techniques.

With the relation of the ontology, information regarding the specified concept can be linked into a graph. This ontology thus can represent local products related to their community, culture, and applied inherited wisdom in a structural form with relations as a machine-readable graph. This assists to illustrate specialties of local products with abstract ideals relating to cultural beliefs which can rarely be found in a mass product.

4.1.2. Ontological Instantiation

Instances of this ontology are CE products with additional data regarding the designed properties following the ontology schema. Since the required data for the system are not usual information obtainable elsewhere, we need to contact product owners directly to access the necessary data for the system. As we obtained the data from the interview of product representatives mentioned in Section 3 to fill up the questionnaire, the products with basic information and categorised cultural aspects for specialty are instantiated to the ontology schema. The scope of the data is CE products within Nonthaburi province, Thailand.

The data collected from the interview now become the answers of the questionnaire. The obtained answers for each question in the questionnaire are then instantiated to the designed ontological properties. The English-translated questions are summarised in Table 2.

Details of the products thus are mapped into the designed ontology and are ready to use in the system. Furthermore, we can also learn how products contain cultural value and how they relate to each other with the help of a graph from the ontology. For example, a knowledge graph related to a product can be generated based on the relation of the ontology as shown in Fig. 3.

From an example given in Fig. 3, the focused CE product instance is *Hand-bag made by Thai Chest-patterned Fabric*. It directly relates to a material, *Cotton*, and to a cultural_related variable, *Thai Chest-patterned Fabric* according to the ontology schema, since the product concept has the properties of 'related to cultural aspect' and 'related

Table 2. Questions to obtain instances of community enterprise ontology

Question	Answer type	Linking to ontology
Product name	Free fill	Data property: product_name
Product type	Choose from the given list	Object property: product_type
Price	Number in Thai bath	Data property: price
Manufacturer	Free fill	Object property: Made by
Manufacturing type	Choose from the given list	Object property: manufacturing_type
Cultural selling point	Free fill	Object property: related to cultural aspect
Quality selling point	Free fill	Object property: related to quality aspect
Used materials	Free fill	For analysis to link to selling point instance
Main feature	Free fill	For analysis to link to selling point instance

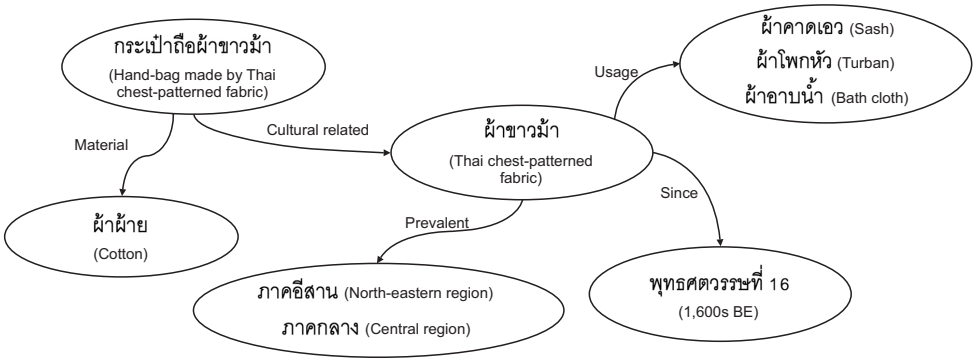


Fig. 3. A knowledge graph of a community enterprise product according to the given ontology schema.

to quality aspect.' The *Thai Chest-patterned Fabric* is an instance of the class 'Culture' that comes with the link to specific property details such as 'prevalent,' 'since,' and 'usage.' These three properties which are data properties then have a defined value; for example, the prevalent property informs that the culture concept is prevalent in an area of the North-eastern and Central Region of Thailand. This graph hence shows the relation to other concepts according to information of products, and these make the product itself different from another. In case two or more products share the same property value such as a cultural_ related *Thai Chest-patterned Fabric*, those products can also be considered as they are culturally related to one another and are linked in the graph via the shared property.

As data for this research, there are 67 voluntary CEs providing their product details for a total of 82 CE products. The products are in categories of equipment, accessory, household decorations, consumable goods, and processed material. For the cultural aspect, the products are mostly from Nonthaburi province; thus, only Central region cultural aspects are found in this set of data.

4.2. Semantic Search System for CE

With the ontology and its instances, the knowledgebase for the semantic search system is ready. Semantic search in this work refers to a function of retrieving knowledge from richly structured data sources given in the designed ontology, which enables the formal articulation of domain knowledge at a high level of expressiveness and allows users to specify their need with details as storage in structural ontological representation. To apply the ontology into a semantic search system, an ontology application management (OAM) framework (Buranarach et al., 2016) is chosen as a framework to connect ontology and semantic queries to allow the retrieval of both explicitly and implicitly derived information, based on ontological structural information through pattern matching and inference reasoning.

The search result thus comes with rich expressiveness of the ontology and its instances. We design the user interface to display the search output as an e-catalogue as details of product are given in a structural info box to clearly define information type, which can prevent ambiguity and confusion.

Aside from matched search results, it is possible that users may be interested in a similar item with a different name or keyword. Hence, we chose to develop a recommended system to display similar products to users' query results as advertising products. The selected approach for recommendation in this work is content-based filtering approach (Mooney & Roy, 2000). This approach exploits given characteristics of products to recommend additional products with similar properties. As applying to an ontology-based system, properties of the designed ontology are used for calculating for similar products.

Cosine similarity is applied to find similarity between queried products and the rest. Cosine similarity is a measure of similarity between two non-zero vectors using a given set of attributes (Sitikhu et al., 2019). The vector of attributes from an ontological instance is a representation of a product computational pattern in which the patterns can be matching to one another to find their similarity. For this work, two vectors of attributes for similarity comparison are ontological object properties while ignoring data properties, since data properties inform on naming and numerical data which contain less meaning. Thus, only object properties are used as attributes for calculating for similarity. The two vectors S and O for a product from a searching result and other products respectively are defined to compare for the cosine similarity using a dot product and magnitude as given in (1).

$$similarity = \cos\theta = \frac{S \cdot O}{\|S\|\|O\|} = \frac{\sum_{i=1}^{n} S_i O_i}{\sqrt{\sum_i^n S_i^2}\sqrt{\sum_i^n O_i^2}} \quad (1)$$

where S_i and O_i are components which refer to values from ontological properties of vector *S* and *O* respectively. The similarity score can range from –1 to 1 where 1 signifies exactly the same and –1 means exactly the opposite, with 0 indicating decorrelation, whereas in-between values refer to intermediate similarity or dissimilarity. Since components in an ontology can be related to another in the form of an ontological hierarchical tree, logical inference is applied to extend the object properties to include their immediate parent and child concepts, but the found data properties using hierarchical inference are weighted down for half of the given score.

In fact, the searching result is able to yield several products, and these products are used as vector *S*. Hence, each *S* produces a set of similar products. We then calculate for a summation of similarity scores. The 5-top ranked products based on similarity score then are listed for recommendation. An example of the search result and recommendation is illustrated in Fig. 4.

From the example of an ontology-based system, the matched result is given at the top of the page with its ontological properties. The underlying properties give

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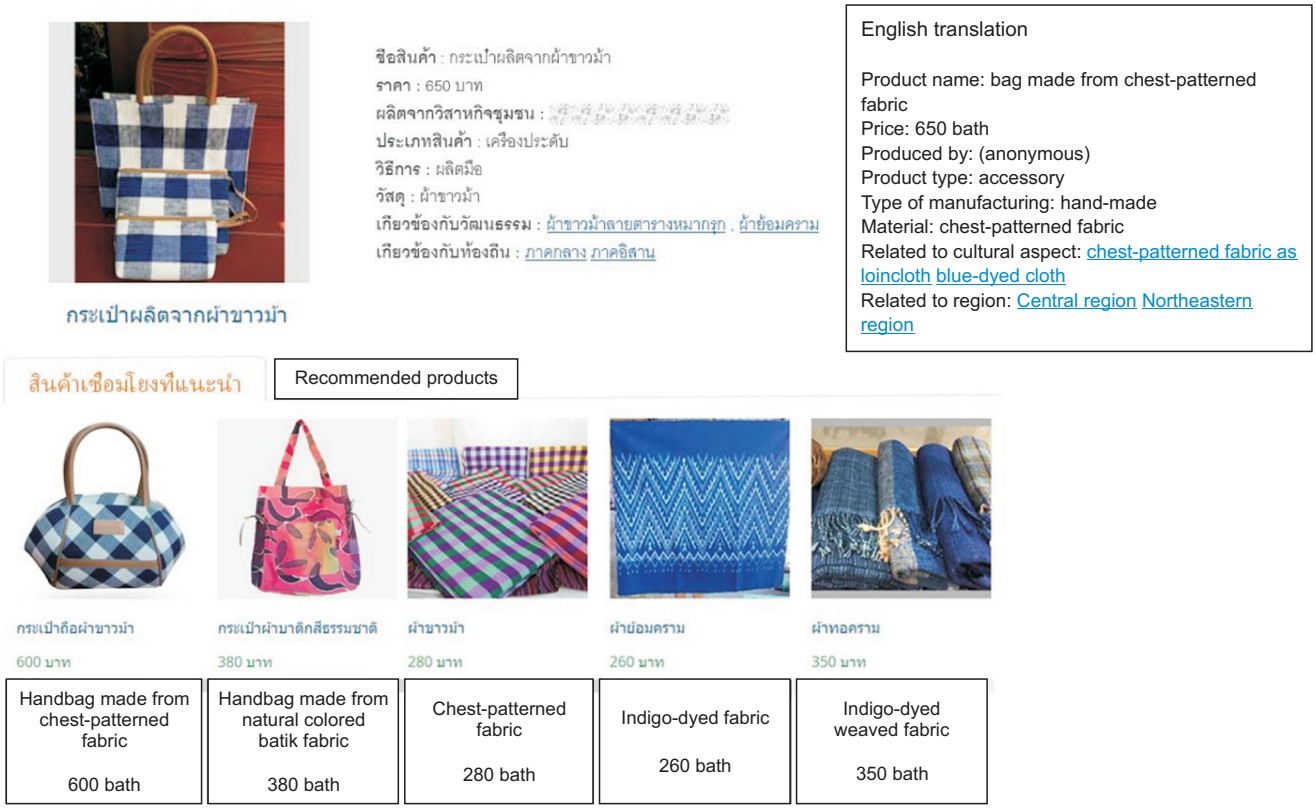


Fig. 4. An example of a semantic search result and recommendation from community enterprise ontology.

a link to a related page of knowledge. The bottom part shows the recommendation results similarly related to the focused products. The example searching result shows a bag made with Thai chest-patterned fabric (**ผ้าขาวม้า**) with properties such as type of 'manufacturing' property indicated as 'handmade' (shown as '**ผลิตมือ**'), and 'related to cultural aspect' with 'Thai chest-patterned fabric' (shown as '**ผ้าขาวม้าลายตารางหมากรุก**'). These properties are used for calculating a similarity score with other products given in the knowledge base. The other products that share the same property values will be ranked high from the high calculated similarity score, and those top-ranking products are recommended. In this example, the shared properties from the queried product and recommended products are mostly related by 'Thai chest-patterned fabric' and 'handmade,' because all the recommended products share the same properties and result in a high similarity score for recommendation.

This recommendation list is expected to help users to find similar products further than what they seek and to extend their searching with more options. With the pattern of similar properties, advertising similar products is beneficial to both users and CE owners for reducing transaction costs of finding and selecting items in an online shopping environment.

5. EVALUATIONS

We set up two experiments to test the capability of the proposed system. First, we evaluate the ontology to ascertain its quality. Second, users of the ontology-based application are asked to assess its usage.

5.1. Ontology Evaluation

Five ontology experts were asked to rate the ontology and its instances in a 5-point Likert scale with 1 for very poor, 2 for poor, 3 for average, 4 for good, and 5 for excellent. The aspects for evaluation include consistency, completeness, conciseness, expandability, and sensitiveness (Gómez-Pérez, 2004). The ontology evaluation results are given in Table 3.

The ontology evaluation results are good in all aspects, as the median of the considering aspects is 4. The experts mostly favour the consistency of the ontology with a mean of 4.4 since they found the class and property design to be consistent, while expandability got the least score as a

mean of 3.8 for many specific representative classes. Another remark from experts is that the instances for the ontology should be clarified into more details, as some can be useful in a schema level for inference.

5.2. Usage Evaluation

To evaluate how the system performs, we asked 100 users to test the system. Users were to search for their own criteria 3-10 times. In this experiment, 497 queries were made from 100 users, and 2,485 recommendation products were generated in total. For the system, two functions are evaluated as searching and recommending. We determine the search results with the criterion of matching user intention or not; thus, the result is either 'matched' or 'not matched' for determining accuracy. Percentage is calculated to present the search result of the 497 queries. For the recommendation function, since the recommendation is a list of related items considering similarity score and expecting to interest the user, we asked users to rate each recommendation in the generated list as 'interested,' 'similar but not-interested,' and 'not similar.' Then, a percentage of the rating is calculated to present the capability of the recommendation. The usage evaluation results of both search and recommendation are given in Table 4.

The results from Table 4 show that users found the results to be accurate for 97% while the recommendation made the user interested for 85% of the time. Upon analysing the inaccurate results and not-interested recommendation with the users, we found that the cause was not from incorrect retrieval or mistakes from data but users' misunderstanding of ontological concepts. For example, some users did not expect to find a plant pot (กระถางต้นไม้) as a decoration but as a gardening tool, as their purpose for the item is a ware to keep a plant in. Thus, they marked the results as not-matching. This, though, may come from the concrete design of product categories that are not flexible to users' perspectives. This result, however, is not a mistake of either the ontology design or users, since we cannot argue that the plant pot belongs to either class depending on the perspective of things in the world based on the roles of an object. Unfortunately, the ontology is not allowed multiple parent classes, and this becomes a limitation of the current approach.

Table 3. Evaluation results of the community enterprise ontology

	Mean	Median	Mode
Consistency	4.4	4	4
Completeness	4	4	4
Conciseness	4.2	4	4
Expandability	3.8	4	4
Sensitiveness	4.2	4	4, 5

6. CONCLUSIONS AND REMARKS

This work proposes a method to bring out specialties of local products by linking the products to their intangible values related to cultural and local aspects. Since local products may look inferior comparing to the latest global commercial goods in terms of advance technology and design, they have their own specialties and values within them from their representative culture and traditional design. An ontology is developed to represent hidden cultural relations and used as a core for matching products to users' interests and displaying their intangible values as a structural graph-based representation. The searching system and recommender are developed to demonstrate the usefulness of the ontology.

For ontological instantiation, since the focused aspects of the products including related culture and beliefs are rather new, existing product information cannot be directly applied to the system. Hence, we ask for details from communities who produce the items for their insight and knowledge. The information is manually processed into instances and property values. This process requires several branches of knowledge to realise the relation and to maintain precision of the ontology result. With the 67 voluntary CEs, there are 82 local community products registered as instances mapped to the developed ontology for use in the system.

The evaluation results of the ontology show that the

Table 4. Evaluation results of the proposed system

	Matching user criteria		Not matching user criteria
Search accuracy	97.38% (484)		2.62% (13)
	Interested	Similar but not interested	Not similar
Recommendation efficiency	85.03% (2,113)	10.34% (257)	4.63% (115)

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designed ontology is acceptable for consistency, completeness, conciseness, expandability, and sensitiveness aspects as they all obtained a good evaluation in median from the five evaluators. The system was evaluated for practical usage and received 97% accuracy and 85% recommendation efficiency. From analysis, the current ontology approach signifies a limitation of categorisation. Since an ontology allows only one parent concept, the current designed product categories become rigid, as a product can belong to one specified category. This leads to a rigid viewpoint of conceptualisation which varies between different users, and it may cause misunderstandings or mislead in defining searching criteria. To further develop this work, we aim to include more local products from CEs around Thailand. Furthermore, we will design a method to break through the limitation of multiple categorisations without losing the ontological ability to link implicit relations for semantic and knowledge inference.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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Infodemic: The New Informational Reality of the Present Times

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ABSTRACT

This text discusses elements and characteristics of contemporary informational reality, that is, the ways of producing, circulating, organizing, using, and appropriating information in the current context. Initially, seven terms and concepts used to describe this reality are discussed: fake news, false testimonials, hate speech, scientific negationism, disinformation, post-truth, and infodemic. Next, an attempt is made to present a framework for such phenomena as an object of study in information science. Therefore, this scenario is characterized based on the three main models of information science study: physical, cognitive, and social. The contribution of each of them to the study of contemporary informational reality is analyzed, identifying aspects such as the bubble effect, clickbaits, confirmation bias, cults of amateurism, and post-truth culture. Finally, it presents the discussion of a possible veritistic turn in the field, in order to think about elements not covered so far by information science in its task and challenge of producing adequate understanding and diagnoses of current phenomena. In conclusion, it is argued that only accurate and comprehensive diagnoses of such phenomena will allow information science to develop services and systems capable of combating their harmful effects.

Keywords: infodemic, disinformation, fake news, scientific negationism, post-truth

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1. INTRODUCTION

Information science was born in the 1960s, focused, as expressed in Borko's (1968) classic definition, on the study of the behavior of information and forces that govern its flow. The post-war context set the tone for what was required of the new area: guaranteeing scientific foundations for the construction of scientific and technological information systems, services, and structures to guarantee their transfer among scientists from those in the productive sectors to society, faster, more accurately, and with less cost (Saracevic, 1999). Six decades passed, several technologies were created, and new services and systems and ways of organizing and making information became available (Gleick, 2011). The issue of guaranteeing access to information is no longer central to the area. Today, there is a lot of access to information, instantly and ubiquitously – although part of humanity does not have yet the conditions for this access and some barriers remain, such as, for example, scientific journals that charge for access to information (Ibekwe-SanJuan & Dousa, 2014; Lafrance, 2010; Mattelart, 2002).

The wide access we currently have to information, in the second decade of the twenty-first century, contrary to the predictions of the 1960s and 1970s, has not resulted in wiser, more rational, and more tolerant societies. Different research has shown the growth of authoritarian regimes and governments, xenophobic and racist practices, greater individualism, and increases in religious fundamentalism, in addition to the proliferation of conspiracy theories and scientific and historical negationism (Shu et al., 2020). Along with all this, as a cause and also as a consequence, there has been an exponential increase in the circulation of false information, especially on social networks, in which there is also growing polarization and aggressiveness (Eatwell & Goodwin, 2018; Fukuyama, 2018; Solano, 2018; Williams, 2021). The most important effect of this dimension is related to the fact that people have made their decisions (about health actions, choice of governments, among others) based on such false information. Such issues have characterized a new dynamic of production, circulation, appropriation, and use of information, quite different from those that humanity was experiencing in the 1960s.

The purpose of this article is, precisely, to present and discuss these new informational issues, to highlight which elements, within the scope of information science, must or should be modified, added, or produced in order to have the possibility of studying and intervening in the new informational dynamics. At first, the conceptual framework itself is discussed, as different terms have been used to talk about information in the contemporary moment – some of them synonymous, others complementary. In a second moment, we seek to draw such dynamics within the conceptual frameworks of information science, based on its three paradigms. Next, a new discussion is presented, brought in a complementary way to information science, in which a possible veritistic turn for the area is proposed. The working methods were the literature review and the epistemological analysis, through which a relationship was made between the studies that describe the contemporary moment (through seven concepts, among them the infodemic) and epistemological analyses on the concept of information in information science.

2. DIFFERENT CONCEPTS AND INTERRELATED PHENOMENA

The different terms that have been used to describe the contemporary informational scenario cover specific aspects of this scenario or refer to a dimension of the problem. Several researchers have shown that this scenario is actually made up of different aspects and dimensions, which sometimes overlap and/or complement each other (O'Connor & Weatherall, 2019; Peters et al., 2018). One of the challenges that arise at this time, for the various sciences that seek to study such phenomena (including information science), is precisely to identify each of these aspects, analyze the terms, concepts, and categories of analysis used to study them, and propose a general conceptual framework capable of interrelating them.

2.1. Fake News

The first concept to be highlighted is fake news. There is resistance to the use of this term by journalists and communication scholars, due to the fact that if content is false, then it is not news – news being understood as a journalistic category (Allcott & Gentzkow, 2017; Osho, 2020; Waisbord, 2018). The abundant use of the term, however, ended up making it fundamental for the understanding of our actual society. Literally, fake news means false news. The first element of its characterization is its falsehood: it is produced with the intention of lying, deceiving, distorting, or hiding the truth. The second element is that it seeks to be perceived as true journalistic news. That is, fake news is part of a strategy that recognizes the legitimacy of journalistic discourse and journalistic institutions and, instead of questioning this legitimacy, it actually take

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advantage of these institutions to gain credibility. This not only occurs from journalism, but also from universities, institutes, and science – often fake news appeals to "experts," scientists, professors, and politicians, some fake, others with distorted speech (d'Ancona, 2017).

Fake news reports are, therefore, lies disguised as journalism. They can originate from a website that copies, in appearance, the characteristics of a journalistic website; they may have as their name or web address the same name as an existing institution, with a different letter; they can be signed by people who introduce themselves as journalists without being one, or by people with names almost identical to those of recognized and respected journalists or columnists. The text uses the typical structures of journalism – language, interviews, support in expert assessments, and images, among others.

It should be noted here that, obviously, one does not want to imply that the media always tell the truth. Decades of scientific studies have demonstrated how journalistic vehicles are companies that serve or are susceptible to certain interests of economic, political, military, and religious groups, etc. (Pellicer Alapont, 2017). However, they have always been institutions with headquarters, registration, and hired employees, and to build their credibility, they were never able to invent completely false facts, under penalty of being held responsible and discredited – as evidenced by studies on the institutionalization of journalism in modern societies (Thompson, 1995) and, also, current research on the relationship between fake news and institutional journalistic activity (Braun & Eklund, 2019; Franklin & McNair, 2017). Distortion of facts, favorable framings to one group or unfavorable to another, silence about discrediting facts of its funders, listening to only one side of the issue, and mixing opinions in informative content are some of the various strategies to shape or distort reality according to certain interests. The novelty brought by fake news is the construction of a completely false report, news of a fact that never happened, and its presentation in the mold of journalistic discourse. The strength of fake news resides in the inability (or disinterest, as will be pointed out below) of people in differentiating one type from another, attributing the same degree of reliability to different content just by the appearance of the informational content.

2.2. False Testimonials

The second concept is that of false testimonials. In Spanish, the expression "cuñadismo" has been used (Argemí, 2019) and, with some differences, in English the term "bullshit" (Frankfurt, 2005) is common. It is the old gossip, or rumor, but with a sophistication provided by technological devices (video and voice) which, unlike fake news, is built in opposition to institutions, in the belief that universities, schools, scientists, journalistic vehicles, and international organizations are all manipulators, indoctrinators, and conspiratorial agents, and therefore do not deserve credibility. Testimonials are produced by persons who present themselves as "ordinary" people, who use colloquial language, grammatical errors, amateur footage, and who defend these characteristics as a virtue – the fact that they are simple and everyday, "just like the person who watches," becomes the criterion of legitimacy and credibility, in opposition to the manipulative forces of the institutions of the so-called "system." The strength of the report, degree of emotion of the author or presenter, and importance of the facts presented (usually secret, because they are being hidden precisely by the institutions) add narrative strength to this informative modality. Some facts are directly related to the emergence of this modality, such as the so-called culture of amateurism (Keen, 2007), false equivalence (McIntyre, 2018), and disintermediation of information (Santaella, 2019).

2.3. Hate Speech

The third concept is hate speech. Unlike the first two, it does not seek to be factual, and it does not intend to present a fact of the world. Rather, it talks about the intentions, desires, needs, and fears of a certain individual or group of individuals – for example, that immigrants return to their countries, that feminism disappears, that everything goes back to the way it was before, or that a certain political group be exterminated (Fukuyama, 2018; Greifeneder et al., 2021). Its intention, and here it is complementary to the first two, is to mobilize people to act with emotion and not with reason. More specifically, certain emotions are stoked (fear, resentment, or hate) in order to provide aggressive reactions, especially in relation to disagreement. The other is no longer seen as an adversary, or a bearer of different ideas or points of view, but becomes an enemy to be eliminated, and the whole objective of informational spaces becomes to defeat the other. In this modality, the facts mentioned may be true or not; the intention is to put people in a state of war – but it is precisely this emotional condition that predisposes people to put aside the search for the truth in favor of the most urgent objective of winning the discussion at any price.

2.4. Scientific Negationism

The fourth concept is that of scientific negationism. Many studies show that questions of science have been around for a long time, coming both from common sense, from established authorities in traditional practices, as well as from religious leaders. But negationism as an articulated strategy has, according to historians, a very precise origin: the mid-twentieth century, when science discovered the links between smoking and cancer (McIntyre, 2018; Wilber, 2017). According to the classic study by Oreskes and Conway (2011), once scientific truth was established, the mighty tobacco industry needed to ensure the survival of its business. Tobacco industry groups created a foundation, began funding scientists to say it was not entirely certain that smoking caused cancer (because, of course, they could not prove otherwise), and disseminate the idea that any debate on the topic in universities, schools, or the media should present both "sides" of the issue, that is, those who are sure it causes cancer, and those who say it might. This led to the idea that there were two sides to the issue and, for the lay public, the idea was consolidated that there were scientists who said that it causes cancer and those who said that it does not. This was enough to sow doubt and ensure business continuity. In the following decades, similar strategies were created by business, industrial, and political groups to promote ideas such as, for example, that global warming does not exist, that vaccines cause disease, and even that the Earth is flat.

The core of the issue of scientific negationism, also called fake science, is that every time science discovers a truth that displeases a certain group (a country, business, religion, etc.), this group mobilizes efforts to discredit science and even strengthens itself with the confluence of other negationist movements.

Alongside scientific negationism, there is also historical negationism. Denial of the existence of the holocaust is certainly the best-known example, but there are others equally serious, such as the denial of torture in dictatorial regimes, or that there was no corruption in dictatorships, or that regimes that suppress individual freedoms and implement the policy of torture and killing of political opponents were not dictatorships, among many others. Both scientific negationism and historical negationism benefit from the phenomenon of clickbaits, the social media click hunters (Aparici & García-Marín, 2019). These are groups or people who perceive the potential for visibility of the production of negationist content and do it precisely to obtain views and, with that, economic resources. For many decades, studies on sensationalism have shown the great popularity that misleading content can achieve, but nowadays this dimension is added to the high degree of sophistication in the use of this resource and its link with political, economic, or religious interests.

2.5. Misinformation

The fifth concept is misinformation, and in fact, it has been used contemporaneously with two meanings (Cosentino, 2020). One of them refers to the sophisticated techniques of production of lies, therefore the strategic and intentional dimension of production of falsehood. It is about identifying the groups that produce and disseminate fake news, testimonials, or hate speech, which select the best channels for each one of them, articulate the complementarity of speeches in each modality, and identify the opponents to be neutralized.

In this sense, one of the most successful strategies has been the hijacking of postmodern ideas about truth. The postmodernist movement developed throughout the twentieth century as an artistic, cultural, and also a philosophical movement (Harvey, 1992; Jameson, 1992; Lyotard, 1984). Among its characteristics is the questioning of the idea of the existence of an absolute, unique truth, that is, there cannot be an absolutely correct answer about what each element of reality means. The denunciation that any statement of truth would be an authoritarian act, because it is always ideological, ended up being a criticism hijacked by political movements to say that everything is ideological and, therefore, there can be no "truth," only "alternative facts" – an expression used by United States President Donald Trump on several occasions when he lied and was confronted by journalists, scientists, or members of the judiciary with the evidence of the facts (Kakutani, 2018).

The other use of the expression "disinformation" concerns the effects of these actions, that is, the state of chaos, confusion, or doubt generated in large sections of the population that precisely need and/or seek information to define their opinions and make their decisions. In this second sense, misinformation is very close to the next concept to be presented, that of infodemic.

2.6. Post-Truth

Finally, the seventh concept is the concept of post-truth. Many people criticize its use, identifying that it is actually a fad or a mere synonym for a lie with a different package (Fuller, 2018; McIntyre, 2018; Santaella, 2019). But the researchers who propose it as a scientific concept warn that it does designate an unprecedented question

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in history. Post-truth is a phenomenon that occurs at the confluence of three conditions. The first of these is the widespread dissemination of false information (completely false, and not just distortions as in the era of mass media) with technological support that allows unimaginable reach in the era of gossip and rumors. The second is the possibility of fact-checking these days, where many people can, in a few seconds and with everyday devices such as smartphones or notebooks, verify the information received by them in any medium. The third is the fact that people do not do so, that is, they do not check and do not verify if information is true or false, before passing it on and appropriating it. It is this disinterest, this disdain for the truth, that marks what has been identified as a "post-truth culture" (Wilber, 2017) or a "post-truth regime" (Broncano, 2019). The expression "culture" precisely designates a set of values, naturalizations, or stimuli to a certain behavior – in this case, contempt for the truth, valuing what confirms preconceived ideas, and selecting only what is comfortable. Post-truth characterizes a contemporary imagination in which the disregard for truth is naturalized, encouraged, and exalted as a value or a virtue.

2.7. Infodemic

"Infodemic," of all concepts presented here, is the least developed (Naeem & Bhatti, 2020). The association of the terms "information" and "pandemic" thus characterizes a pathological characterization of the informational dimension: The gigantic scope and speed of dissemination of false information has produced a situation in which false information is more present in people's lives than true and quality information and ends up having much more influence in decision-making and in defining courses of action (Zarocostas, 2020; Zielinkski, 2021). This constitutes a "pandemic" nature of informational phenomena, taken from the perspective of its adverse effects or dysfunctions. The term was created in 2020 and promoted by the World Health Organization to designate precisely the role of information in the pandemic scenario caused by COVID-19 (Pan American Health Organization, 2020; World Health Organization, 2021), and the World Health Organization created an event to discuss the infodemic (World Health Organization, 2020). In this sense, the term "infodemic" designates the general conditions through which information is produced, circulated, disseminated, received, used, and appropriated by people at the contemporary moment. The exercise of identifying such conditions also implies considering the technological means of such production and circulation, the economic and legal forces that act on these processes, and the ways people behave in relation to them.

3. CONSTRUCTION OF THE INFORMATIONAL PHENOMENON

There is a reasonable consensus in the area of information science that, throughout its history, the area has presented three major models for the study of information or, as some call it, three paradigms (Bawden & Robinson, 2012; Capurro, 1992, 2003; Linares Columbié, 2005; Salaün & Arsenault, 2009; Saracevic, 1999): a physical model, a cognitive model, and a sociocultural model. The object of study of information science would involve, among other possibilities, the exercise of identifying its technical or physical dimensions, its semantic or cognitive dimensions, and its sociocultural or pragmatic dimensions.

3.1. Three Models of Information Study

The first of these models is linked to the very birth of information science, in England and the United States, during the period immediately after World War II, linked to the importance that information had, in this context, for scientific and technological development during the cold war period (Shera & Cleveland, 1977). In this sense, "information" was understood in a very specific sense, as scientific and technological information, and its study took place within an essentially governmental and military logic, that is, the objectives with the study of information, even before they were properly scientific, were pragmatic, related to a context of competition between countries for hegemony in the international scenario. Studying information was to understand and map the production, circulation, and use of scientific and technological information (and only this) in order to think about instruments for its processing to ensure greater speed, lower cost, and greater accuracy in its transfer within the scientific community, and from this to strategic sectors of government and military environments (Coll-Vinent, 1984; Debons et al., 1988). It was a very specific way of knowing (based on a set of interests) and required the delimitation of something very specific to be known – what was considered an object of study in information science.

A science of information control was developed there, of the development of techniques for its optimal processing in a context of competitiveness among countries through the development of their scientific information systems (Davis & Shaw, 2011). The theoretical model of

this approach, known as the "systems paradigm" or physical paradigm (Capurro, 2003) or positivist model (Budd, 1995), which presupposes the study of information systems isolated from social life and users, basically comes from quantitative measures of information retrieval performance (Bawden & Robinson, 2012).

In the following decades, a second way of studying information developed in information science, the so-called cognitive perspective, centered on users (Belkin, 1980). This movement represented a shift in the same research logic from the governmental and military environments to the scope of the industrial and business sector, with demands for efficient management, operation, and control (Debons et al., 1988). The novelty, from a conceptual point of view, was the introduction of a perspective that was no longer oriented towards systems, but towards users or customers (Hjørland, 2018a). Thus, the study of human cognitive processes and their modeling took place, with the aim of developing information systems that could replicate such processes, so that the focus of the studies was on individuals relating to information and the manifestation of their needs and procedures for solving those needs (Bawden & Robinson, 2012; Brookes, 1980; Gilchrist, 2009).

At the end of the twentieth century, the construction of the third major perspective of information studies began. Linares Columbié (2005) highlights the novelty of this movement as being another epistemology of information science from the study of society and culture. Cronin (2008) speaks of a sociological turn in information science, following the cognitive turn of the 1980s. Budd (1995) speaks of a hermeneutical phenomenology that takes into account the intentional stances of the human actors. Brier (2014) defends a cyber-semiotic perspective, going beyond just a syntactic or just a semantic perspective in the study of information. Hjørland (2018b) mentions recent views oriented from a social and cultural perspective. Bawden and Robinson (2012) indicate a socio-cognitive paradigm, inspired by Shera's social epistemology and Hjørland's domain analysis, which seeks to examine a level of analysis broader than the individual (social groups, communities, or countries) as well as other issues beyond cognition (only the mentalist level of information phenomena), in a tendency to articulate individual and collective levels of information. This third approach has expressions in theories such as information regimes, domain analysis, informational practices, folksonomies, and altimetry, among others, focused on the socially constructed character of information and its imbrications with political, economic, cultural, legal, and technological dimensions, and other aspects of societies in which information phenomena exist and are constituted.

3.2. Current Phenomena According to the Three Models

Analyzing the contemporary informational scenario with such references, it is possible to identify, initially, a specifically physical, technical dynamic of the problem. This dynamic concerns technologies and logic of "personalized" information delivery promoted by the algorithms that structure search engines and social networks – these, which ended up becoming the privileged environment from which people receive news and information of the world. And they are built from algorithms that select what people are likely to want or what agrees with their point of view, in a phenomenon known as the "bubble effect" (Magallón Rosa, 2019). On social networks such as WhatsApp, messages are sent en masse directly to people's devices, without anyone being able to monitor or oppose them, in an "underground" logic of information dissemination. With the formation of "bubbles" or "echo chambers," in which users are isolated, closed to new ideas, issues, and important information, especially in politics, people end up exposing themselves "almost exclusively to unilateral views within the broader political spectrum" (Santaella, 2019, p. 15).

Along with this phenomenon, there is also the existence of platforms, applications, and services that enable the mass dissemination of false news. Although this is not exactly a new phenomenon, there is a new dynamic, through transfers made by common people, verifying the absence of regulations such as those that affect journalistic or educational institutions, in a logic in which all information has the same weight or value, regardless of its quality, verification, and institutional commitment behind its production. Such phenomenon is further strengthened by the action of clickbaits, that is, the dissemination of false content or the insertion of sensational titles so that users will access the content, with the aim of generating traffic and benefiting from advertising (Aparici & García-Marin, 2019). In this dynamic of a gigantic volume of false information dissemination, lies can shape people's decision-making in different spheres (in politics, economics, health education, and religion), in a speed and quantity never seen before.

Such dynamics are complemented with the pervasive information scenario, that is, information as an entity and/or process present in all our activities, whether pro-

fessional, business, cultural, educational, sports, medical, romantic, etc., in a way or on a scale never seen before, related to apparatuses or devices as different as computers, cell phones, houses, cars, or objects, also related to the emergence of the so-called Internet of Things. Linked to this is also the phenomenon known as big data, which is related not only to the production, on an increasingly gigantic scale, of information, and the impact of this information on our lives, but also to the very way information is produced. This phenomenon is related to the fact that, increasingly, there are datasets generated unintentionally, not programmed, by people. Now there are systems that are capturing steps, paths, and biometric indicators, and they are transforming all of this into data sets that are appropriated and used for different purposes, from security and convenience to surveillance and political control, also representing a challenge to the privacy of people's data.

The very speed of information and the need for updating are also noteworthy, when measuring in minutes or seconds the gap in people's knowledge about a given fact or subject that may be occurring in a local context or even in distant countries. This involves the large volume of information that instantly arrives to individuals, in very different formats, languages, and supports, such as texts, images, sounds, moving images, and other derivatives thereof.

The aspects raised above are thus related to the physical or technical dimension of the information identified and studied in the first major model for the study of information science. But, as pointed out above, a cognitive perspective developed in the area, after a few decades, centered on the tripod of data, information, and knowledge.

This second dimension of information phenomena is related to the human level or, more properly, to the human cognitive dimensions often identified in studies on fake news, misinformation, and post-truth: the existence of the so-called cognitive bias, or confirmation bias, or even cognitive dissonance. It is a human tendency to form beliefs and worldviews without being based on reason and evidence, that is, on facts, in an effort to avoid psychic discontent.

McIntyre (2018), discussing the current post-truth scenario, points to three classic studies in social psychology conducted in the United States, in the 1950s and 1960s, that demonstrated this issue. The first of those is Festinger's theory of cognitive dissonance, according to which we seek harmony between our beliefs and actions. The second is Asch's theory of social conformity, which postulates that we tend to give in to social pressure out of our desire to be in harmony with others. The third is the confirmation bias study conducted by Watson, which identified our tendency to give more weight to information that confirms our pre-existing beliefs. McIntyre also presents recent studies on the issue, expressed in two concepts. The first is the counterproductive effect, a phenomenon in which the presentation of true information to a person that conflicts with their beliefs in false facts makes the person believe those false facts even more strongly. The second is the Dunning-Kruger effect, a phenomenon in which our lack of ability to do something causes us to overestimate our real abilities. The consequence of this phenomenon is that, often, people who have little knowledge about a subject believe they are more knowledgeable about it than others who are better prepared (and precisely because of this, the latter consider themselves and declare themselves less able to talk about the subject) and this causes people to make wrong decisions motivated by that kind of ignorance or unrecognized incompetence, which diminishes their ability to recognize their own mistakes. Such elements of cognitive bias make people prone to form their beliefs without regard to reason and evidence. That is, people's relationship with information is not just one of data appropriation, as formulated in the cognitive approach of information science in the 1980s, but also of refusal of data that confront one's worldview, and acceptance only of data and evidence that confirm prejudices and guarantee psychic comfort. This phenomenon has increased importance in the context of formation of the bubble effect mentioned above, as it isolates people from the contradictory, of different views, in a dynamic of reinforcement of worldviews and prejudices.

And there is also a third dimension of the current informational outlook, which is cultural (and, therefore, related to the third great model for the study of information science). Its importance is such that there are authors, as pointed out in the previous topic, who refer to a "post-truth culture" (Wilber, 2017) or to a "post-truth regime" (Broncano, 2019).

Currently, people in general (except, of course, a portion of the world population without the economic conditions for this, as mentioned above) have easy and instant access to technologies and possibilities to verify the veracity of information, through smartphones, notebooks, desktop computers, or other devices. Unlike other periods in history, when it would be difficult or impossible to check whether information, for example, about the way of life in a distant country was true or false, currently, at home and

in a few seconds, it can be checked. But people do not do this. They accept it as real, pass it on, share, and appropriate information without bothering to verify it. It is this disdain, this disinterest in the truth, in a context with so much access to information, which is the new fact that the idea of "post-truth" as a culture seeks to encompass.

In this sense, post-truth designates a condition, a context, in which attitudes of disinterest and even contempt for the truth become natural and disseminated, and become everyday, normal, and even stimulated. There is a process of acceptance and replication of concepts that normalize disdain for the truth: Post-truth "is an idea, an imagination, a set of social representations or meanings already incorporated by audiences and from which the existence of fake news that refers to this idea is possible, affirming or expanding it" (Murolo, 2019, p. 68, our translation). This dynamic ends up giving force to clickbaits and other mechanisms for disseminating false information.

Wilber (2017) analyzes this phenomenon within a wide-ranging change in the framework of values of contemporary societies. It starts from the election of Donald Trump as president of the United States and the exit of Great Britain from the European Union, two phenomena directly associated with the triumph of false information produced, disseminated, and consumed en masse, and which guided people's decisions in a given voting time, and associates them with others, such as the decrease in the value of democracy, or the increase in hatred, racism, xenophobia, or bad taste, among others. And with that, Wilber frames post-truth within a broad process of changing cultural values in the world – and especially in Western societies.

Wilber analyzes the values and ideas in a situation of leadership or acceptance in the world at a moment (what he calls "vanguards"). He identifies that, in the first half of the twentieth century, the world was driven, in various political, cultural, and intellectual movements, by values associated with the rational, operational, and conscious, the ideas of merit, profit, and progress – that is, directly related to the ideal of modernity. In his analysis, he considers that, after the 1960s, ideas associated with postmodern values such as the defense of plurality, relativism, self-fulfillment, inclusion, multiculturalism, civil rights, sustainability, and defense of minorities, among others, would be in force. And, following the analysis, Wilber points out that, in the second decade of the twenty-first century, a crisis of this project is taking place, a failure of the progressive vanguards.

Wilber points out several factors that might have caused this failure. Among them is the relativization of the idea of truth, the idea that there are local, particular truths, which led to a form of generalized narcissism: the inability to assume the other's perspective, the loss of the feeling of empathy, and the hatred against minority points of view, leading to essentialist views, with tendencies towards racism, patriarchy, and misogyny; and a crisis in the legitimacy of modern institutions, human rights, reason, science, and democracy.

Along the same lines, but in a more specific focus, Keen (2007) identifies what he calls the "cult of amateurism," a certain celebration of amateur content that ends up nullifying the distinction between the professional and the amateur, which leads to the weakening of newspapers, magazines, music, film, and journalistic industries, with the consequent disappearance of professional standards and editorial filters and the exaltation of plagiarism and piracy.

The frameworks presented so far allow the identification of several dimensions of contemporary informational dynamics. The centrality of the question of "truth," however, remains a problem. How is it possible to have services and systems capable of identifying and selecting false and true information? Who would have the power to determine the degree of veracity of the information? How can creators and disseminators of false information be blamed? How can one act in the face of a culture of disdain for the truth?

In the next topic, a discussion arising in the field of information science is presented, which seeks to show new theoretical elements to adapt the area to the effective study of contemporary dynamics.

4. A VERITISTIC PROPOSAL IN INFORMATION SCIENCE

The first proposal of a possible veritistic turn in information science – that is, to place the question of truth at the center of scientific and professional activity – was made by Fallis (2000) from the proposal of a veritistic social epistemology made by Alvin Goldman. Fallis reports that this proposal sought to study the social practices that contributed to the production of errors and lies in the social creation of knowledge. The fields of action initially thought of by Goldman were science, law, and education. Fallis proposed to bring this theory closer to information science through the incorporation of libraries and other information services and systems in the scope of the studies. In a later work, Fallis (2002) seeks to bring this idea of

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proposal closer to the social epistemology made by Jesse Shera and Margaret Egan in 1952, thus seeking a foundation for information science by bringing together the two discussions: that of social epistemology and that of the vertical turn.

The defense of Shera and Egan's social epistemology as a general foundation of information science is also carried out by other authors. Among them, Budd (2002) stands out, who proposes that this theory can be useful to conceive information science as an area dedicated to the study of all the ways in which a society deals with the knowledge that it produces and consumes. In a previous work, Budd (2001) had already analyzed the issue of error and false information in the scope of the construction of scientific knowledge and its impacts on information science.

Taking up points made by these authors, Jonathan Furner elaborated a new proposal. Furner is a researcher who has been questioning the epistemological bases of information science for some years, from an approximation with the Shera's social epistemology (Furner, 2002), going through some more general philosophical questions (Furner, 2010, 2015) and reaching a problematization of the concept of information in the five sub-areas (information behavior, information retrieval, information metric studies, information organization, and information ethics) of information science (Furner, 2014).

In a more recent work (2018), Furner seeks an epistemological foundation for the knowledge organization (KO) based on contributions from epistemology and ethics – and, more specifically, from social epistemology and epistemic justice. Based on the articulation between three concepts (truth, relevance, and justice), he proposes a veritistic turn for the area, so that it can be a critical knowledge organization (CKO). The proposal of a veritistic turn means placing at the center of research in information science the notion of truth, instead of the notion of relevance, traditionally consolidated as central in the field.

Furner (2018) starts from philosophy, more specifically from a branch of it, ontology, which studies the philosophy of being, of things that exist, of what types of things exist, of how they can be classified. He proposes to think of the KO as an ontology, substituting "things" for "data" – the KO would be, thus, a "philosophy of data." It would be composed of elements from three traditional branches of philosophy: the philosophy of mind, philosophy of language, and philosophy of belief. The latter is taken by Furner as synonymous with epistemology or philosophy of knowledge. Furner identifies, in it, the existence of two types of theories: truth-oriented theories, which can be defined as belief theories that distinguish between true and false beliefs; and relevance-oriented theories, which can be defined as belief theories that distinguish between relevant and non-relevant beliefs. Based on this, he detects the existence of a historical disconnection between epistemology as a subfield of philosophy and library and information science (LIS): in the first, theorizing about belief is truth-oriented; in the second, it is relevance-oriented – relevance has become the main criterion for determining information retrieval.

Still in the field of epistemology, Furner proposes that epistemology can be divided into types, according to three criteria. The first criterion is that it distinguishes pure epistemology (composed of descriptive theories of the nature of epistemic concepts and practices) and applied epistemology (composed of normative theories, which seek to guide the most favorable practices to obtain true or relevant propositions). The second criterion has to do with methodology, and a rationalist or naturalist epistemology can be identified, depending on the subject's readiness to admit different types of evidence in support of the conclusions. Finally, according to the main factor in the formation of beliefs, epistemology can be individualistic (when considering the subject's interests) or social (when choosing to focus on social interaction). Combining these criteria, Furner proposes applied social epistemology (the study of normative questions about social practices that are most likely to generate true or relevant beliefs) as an adequate theoretical framework for his proposition of a CKO.

Next, Furner addresses the issue of justice. He presents justice as a value (such as truth, relevance, beauty, and freedom) related to a characteristic that is desirable in the results of people's decisions and actions. Justice is achieved when people are treated according to their merits or needs, without prejudice or discrimination, without violation of their human rights, without limitation of their freedoms, and without the exercise of any form of oppression arising from asymmetrical power relations. Furner identifies different types of rights (natural, human, civil, group, or individual) related to equitable access to certain goods or opportunities. In relation to the field of information, he lists six types of rights: the right to think (to conceptualize, categorize and classify, believe, and have opinions); the right to express oneself (to give voice to one's thoughts in speech, writing, and in other ways; the right of access (the possibility to seek, investigate, find, hear, and know the thoughts and expression of others); the right to be heard (to publish and broadcast, to reach an audience without

being censored, silenced, hidden, or ignored); the right to be "left alone" (to maintain privacy); and rights to have credibility (to be treated as someone who has credibility).

When dealing with theories of justice, Furner first identifies what he calls social or distributive justice theories, those focused on the results of actions taken to distribute, according to fair criteria, amounts of resources among members of certain populations. Such theories aim to guarantee: the reduction of divisions, disparities, and inequalities between rich and poor, or between the powerful and the powerless; fairer distributions of social, cultural, economic, and political opportunities; and building and maintaining prosperous communities in which human rights and freedoms are respected. At the same time, the author raises the need to contemplate theories of injustice or oppression, which seek to denounce processes such as exploitation, marginalization, promotion of impotence, cultural imperialism, and violence. Furner concludes that working towards social justice involves the basic reform of oppressive and discriminatory social practices and institutions, as well as the redistribution of resources. Among such practices and institutions, he points out those involved with the production and consumption of knowledge – among which are libraries, information services, and knowledge organization systems, as well as bibliographic classification systems, lists of subject headings, and thesauruses.

Continuing his argument, Furner introduces the theory of epistemic justice, developed by Fricker (2017) and focusing on the fairness of how people are treated in their ability to know and have beliefs. Furner mentions Fricker's distinction between types of epistemic injustice: distributive (which occurs whenever epistemic resources, such as education or information, are unfairly distributed); discriminatory (which occurs whenever failures are attributed to an individual or group); testimonial (when prejudice or a deficit of authority is attributed to an individual producing a discourse); and hermeneutical (when individuals are hermeneutically marginalized, that is, they belong to groups without access to equal participation in the generation of social meanings). In Furner's assessment, social justice has become an objective of professionals working in libraries and information services. However, these professionals did not appropriate the theory of epistemic justice – although there has been applied social epistemology.

Based on the categories and concepts presented throughout his argumentation, Furner then proposes four foundations for the construction of a CKO: to be informed by applied social epistemology (identification of the conditions under which testimonies must be evaluated as true or relevant); be inspired by values of epistemic justice (not only social justice as the primary end of libraries and information services, but also justice in the dissemination and acquisition of true beliefs); to respect human rights (the right to witness justice, to have credibility); and, finally, to privilege truth over relevance. It is in this last aspect that Furner proclaims a veritistic turn for information professionals. A relevance-oriented KO is one that seeks to assess practices, institutions, and information products based on the satisfaction of users' desires and needs; a truth-oriented KO is evaluated based on the verification that the beliefs acquired by the users are true.

In another paper presented as a lecture (Hartel, 2018), Furner once again starts from the intersection between epistemology and ethics to propose a critical library and information science (BCI). For this, he first starts from social epistemology as a possibility for BCI to apply the values of truth and relevance in the construction of information access systems. Next, he defends the idea that BCI's mission goes beyond social justice, reaching epistemic justice, that is, equal access for all people to recorded human knowledge from around the world. As a third point, he defends the opportunity for a "veritistic turn" in information science, whereby truth would supplant relevance as the main requirement of providing information to users. In his final proposition, he challenges the field's attachment to the concept of relevance and problematizes the field's adoption of codes of ethics with neutrality claims. In conclusion, he defends the need for a veritistic turn in the face of the "Trump era," marked by the circulation of false news and "alternative facts" (Hartel, 2018). This "hint" given by the author to contemporary issues related to Donald Trump, president of the United States elected in 2016, and the intense dissemination of false information, was what motivated the problematization of his proposal based on the aspects, characteristics, and dimensions of the phenomenon of post-truth, as it has been studied by different authors from various areas of knowledge – as seen, for example, in Wilber's starting point to develop the idea of a post-truth culture.

5. FINAL CONSIDERATIONS

Throughout its evolution and the development of its three paradigms, information science has been dedicated to the study of different dimensions of information phenomena. At first, information science was a way of

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studying information as something physical, that is, as an objective phenomenon, as a sign in which it was understood as something existing in itself, independent of subjects and contexts, as a data, endowed with properties and characteristics that can be measured and explained from the formulation of laws. In such studies, information is linked to notions such as signal, sender, receiver, transport, transference, system, recovery, probability, precision, revocation, and message. In a second instance, it sought to study information as something cognitive, semantic, of a subjective nature, in which the articulation between data, present elements of reality independent from the subject, and knowledge, what individuals know or understand, was considered, with information being the measure of alteration of this state of knowledge, or, in other terms, the product of interaction between data and knowledge, in the scope of the individual. In such studies, information was linked to the concepts of data, knowledge, processing, individual, person, gap, filling, modification, alteration, and meaning. And, finally, a third mode of study centered on pragmatic, intersubjective, and sociocultural dimensions is used to describe it, pointing out that information is something not only of the objective or subjective order, but also of the collective, of a social construction. In these studies, information appears linked to terms such as document, knowledge, action, context, culture, memory, collective, society, and history.

Although all these perspectives provide valuable elements for the study of the various dimensions of information, in none of them, effectively, does the question of truth occupy the center. Perhaps pointing out the need for a veritistic "turn" is exaggerated, in the sense of a possible fourth paradigm for information science. But, with certainty, the elements brought by Turner, as well as by the different authors mentioned in the first part of this text (about the contemporary conceptual framework), point to the limits of the information science produced so far.

It is no coincidence that, among the various expressions that have been used to characterize the contemporary moment, such as the society of ignorance (Serrano Oceja, 2019), the era of resentment (Fukuyama, 2018), the Orwell world (Gómez de Ágreda, 2019), the post-democratic era (Casara, 2019), the national-populism era (Eatwell & Goodwin, 2018), or the great setback (Geiselberger, 2017), there is strong emphasis on the importance of false information. All these theories, among others, point, to some extent, to the aforementioned failure of the promises of wisdom and peace made in the 1960s and 1970s around the idea of an "information society" (Blatt, 2018).

Information science was born, as Borko rightly put it in 1968, to study the properties and behavior of information and the forces that govern its flow. In this sense, the various concepts presented in this article, which seek to analyze the forms of presentation and dissemination of information at the present time (fake news, false testimonials, hate speech, scientific negationism, disinformation, and post-truth) can be understood from the concept of infodemic overview. Infodemic means a mode of production, circulation, dissemination, receipt, and use of information in which the presence of totally or partially false information acquires a fundamental centrality and importance, to the point of making it difficult or impossible for people to distinguish true from false information. The term also includes, as seen, all the negative consequences of such a situation, from sanitary actions to the fight against diseases, such as the survival of democracy and the construction of peace.

If, as diagnosed by different authors mentioned in this text, we live in an infodemic period, one of disease caused by information and by the circulation of false information, it is urgent that information science develops the proper tools to understand this period – to then be able to propose the appropriate interventions to combat its harmful effects, and librarians and information literacy agents should play a leading role in such actions (Agosto, 2018; Revez & Corujo, 2021; Schlesselman-Tarango, 2017).

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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Utilization of Log Data Reflecting User Information-Seeking Behavior in the Digital Library

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ABSTRACT

This exploratory study aims to understand the potential of log data analysis and expand its utilization in user research methods. Transaction log data are records of electronic interactions that have occurred between users and web services, reflecting information-seeking behavior in the context of digital libraries where users interact with the service system during the search for information. Two ways were used to analyze South Korea's National Digital Science Library (NDSL) log data for three days, including 150,000 data: a log pattern analysis, and log context analysis using statistics. First, a pattern-based analysis examined the general paths of usage by logged and unlogged users. The correlation between paths was analyzed through a χ^2 analysis. The subsequent log context analysis assessed 30 identified users' data using basic statistics and visualized the individual user information-seeking behavior while accessing NDSL. The visualization shows included 30 diverse paths for 30 cases. Log analysis provided insight into general and individual user information-seeking behavior. The results of log analysis can enhance the understanding of user actions. Therefore, it can be utilized as the basic data to improve the design of services and systems in the digital library to meet users' needs.

Keywords: log data, information-seeking behavior, log pattern analysis, log context analysis, digital library, South Korea

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1. INTRODUCTION

Users attempt to search for information stored in digital libraries to fulfill their information needs. Traces of tasks that users perform on digital libraries are left in the server of the digital library system in the form of log data. A transaction log is an electronic record of interactions between a web search system and users searching for information on the digital library during a searching episode. Therefore, log data can provide valuable insights into understanding the information search process users undertake on the web (Jansen, 2006). Computer-based methods of capturing user behavior, known as transaction log analysis, automatically capture the type, content, or time of transactions made by a user from the terminal connected to that system (Rice & Borgman, 1983).

To provide information services suitable for users' needs, librarians should understand users. Therefore, librarians have conducted surveys, in-depth interviews, and usability studies to understand users in the libraries. However, these methods are limited to the number of survey respondents and involve high costs and considerable time and effort. If the log data of the digital libraries are analyzed and the results are revealed of users' information-seeking behaviors, it will reduce time, cost, and efforts for research investigating users in the libraries. Furthermore, services and content that users need can be designed and provided.

This exploratory research was conducted to understand user information-seeking behavior by analyzing the log data left on the National Digital Science Library (NDSL, the previous service of ScienceON). The study was divided into a log pattern analysis that focuses on transaction log analyses alone and a log context analysis that combines transaction log data with user information. The research revealed significant insights into the information-seeking behavior of domestic researchers in the digital library. Furthermore, the data pertaining to identified individuals can be analyzed from various angles through log analysis. This study aims to understand the potential of log data and increase its utilization by using log data as a user research method.

1.1. Problem Statement

This study sought to answer the following research questions to understand log data that reflects the information-seeking behavior of researchers searching a digital library in Korea. Up to 85% of all NDSL users did not log in to use the NDSL services and content. In the log pattern analysis, information-seeking behavior was analyzed based on pageviews by logged and unlogged users. On the other hand, information-seeking behavior was analyzed utilizing log data with logged users in context log analysis.

- RQ 1: Can general information-seeking behavior patterns be assessed through log pattern analysis of the NDSL?
- RQ 2: Can contextual information-seeking behavior be assessed by analyzing and visualizing the log data created by identified users?

1.2. Definition of Terms

The followings are definitions of the core terms for log data analysis.

- Information use path: A user's record of using the services and content from a digital library is shown based on time; the details can be verified from the log data.
- Pageviews: This refers to viewing one page on the Internet and is frequently used in website evaluations. Pageviews contain an assortment of information, such as the services or content used on a specific page on the NDSL service. In this study, pageviews were regarded as a single task unit or the unit of analyzing each user's session.
- Log pattern analysis: Analysis of information-seeking behavior such as information use paths for services and content in the log data from website pageviews, stored in the log data.
- Log context analysis: Analysis to understand the information-seeking behavior of each identified user based on the information use paths, including the details of the user's usage time, service, and content accessed in the digital library.

1.3. Literature Review

1.3.1. Log Analysis and Information-seeking Behavior in the Context of the Digital Library

Libraries have traditionally performed user Transaction Log Analysis (TLA) on Online Public Access Catalogs (OPACs) for user research since the 1980s. The Online Computer Library Center (OCLC) studied log data from 1981 to 1983 by analyzing transactions and in-depth interviews. A TLA or online monitoring analysis of the interaction time and content is generated by the user

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from the system terminal, which is collected automatically (Rice & Borgman, 1983). Since the emergence of the Internet in 1993, TLA has been redefined as the analysis of research interactions that are electronically recorded between an online search system and users who search for information on that system (Peters, 1993). Many attempts have been made to implement log analyses in user studies. Transaction log data provide a method for data collection while logging analysis servers as a method of data research. A TLA is defined as an online system and user study method that analyzes the system's performance and user behavior (Jansen et al., 2009).

On the other hand, online data monitoring, known as a type of TLA, is one of several ways to capture the detailed process of how users search for information at a reasonable price. TLA is a data collection technique rather than a research design. It can be used in empirical or field research either by itself or alongside other data collection methods (Borgman et al., 1996). TLA was reported as an appropriate technique for evaluating a search process because it is unobtrusive and provides a qualitative analysis of a quantitative model (Penniman & Dominick, 1980; Rice & Borgman, 1983). Log data are related to the qualitative evaluation of digital libraries and the qualitative evaluation process of interaction with services from a digital library (Koch et al., 2004). Transaction log data is also used as an evaluation tool for improving the user interface or system design. Further, it even supports qualitative evaluations of information behavior paths in an information retrieval system (Borgman, 1986; Rice & Borgman, 1983). As the information use behavior can be analyzed through log analysis, the log analysis method is argued to be an appropriate method for research in the web search field, which involves diverse, heterogeneous user classes (Park & Lee, 2007). Accordingly, studies that analyze search behaviors based on user log data have been conducted (Choi et al., 2018; Choo et al., 2000; Park, 2011; Park & Lee, 2007, 2013).

The berrypicking model as the process of acquiring information through web browsing was proposed by Bates (1989). The users may change their search query, but their searches may shift toward a new direction depending on the search results, or they may change information in each stage of their search process. Users will move from one search information source to another through various methods, such as footnotes, journal citations, reference literature, or local searches, or they may change the domain, and even when they are searching for a different information source. Agosti et al. (2012) analyzed the ten years of research publications about web service and digital library logs. This research showed that web search engine log analyses addressed matters related to representing, saving, organizing, and approaching important information items composing webpages. In the last ten years, this field of research was divided into three parts: analyzing the details of queries made by users from a search engine, how users interact with the search engine, and how the search engine organizes the results. A new log trend pertains to mobile devices, social networks, personalization, and multimedia service technology related to user information-seeking behaviors or system use (Agosti et al., 2012). A log analysis for the digital library is done by analyzing the access log statistics of the library user community to evaluate the digital library and user community (Bollen & Luce, 2002).

1.3.2. Log Analysis of Digital Library in South Korea

Many public libraries in South Korea have also utilized log data to analyze user information behaviors. For example, a study was conducted on the behavior of archive users based on weblog analyses (Lee & Yim, 2015). Another study proposed solutions for strengthening connections between websites on the National Archives of Korea and further developing the search service through analyzing search queries from users and the paths through which they end up on websites from the archives (Jin & Rieh, 2018). Finally, another study analyzed the status of library culture programs based on user participation log data through a case from the National Library of Korea in Sejong (Choi et al., 2018).

Various studies have been conducted through analysis of the NDSL. First, user log files were used to analyze the information needs and use behavior of users of the NDSL (Yoo, 2002). Search log keywords from the NDSL were analyzed, and the automatic category information of the document selected by the user and the categories between words were analyzed (Lee et al., 2012). Finally, an analysis was performed on the correlation between the categorized results of search queries and the categories of accessed documents. One study proposed a user login service policy after conducting a log analysis to promote use of the NDSL (Kim et al., 2013). Another study analyzed the characteristics of queries in one year's worth of log data from the NDSL. In this study, 70% of the queries consisted of one or two words, and 27.29% of the users spent one minute or less on the site (Park & Lee, 2013). However, the session length of users on the NDSL was longer than the time spent on general commercial search services. Moreover, log data from the NDSL reflected time passing over

three years. The queries and browsing requests of long-term users were analyzed, and it was found that while the simplicity of queries and shortness of usage duration remained the same as time passed, the research subject seemed to change with the passage of time. Search queries with a high frequency of use were analyzed, and the information use behavior was analyzed (Park & Lee, 2016). Since log analysis for libraries or information services in Korea primarily constitutes research regarding statistics on the number of uses or search terms, studies are needed to analyze log data from various aspects to understand users' information behavior. Therefore, different from the previous studies of log data of the NDSL, this study focused on revealing users' information behavior rather than search terms. Therefore, the utilization of log data could be expanded.

2. METHOD

2.1. The Process of Research

Table 1 shows the research procedure and details of this exploratory study. First, literature reviews were conducted. Second, log pattern and context analyses were conducted to answer the research questions of this study. For the log pattern analysis, general information behavior regarding the overall usage of the NDSL was analyzed. For the log context analysis, personal information was added to the log information to reveal individual information-seeking behavior based on the log data for each identified user. Finally, the visualization diagrams of the user information-seeking behavior were extracted by analyzing log data for specified users.

2.2. Data

The Korea Institute of Science and Technology Information (KISTI), a research institute funded by the government, has provided science and technology information content and services to users in South Korea for 60 years, since 1962. KISTI had provided services through the NDSL for ten years from 2010 to 2020, and NDSL moved to ScienceON in 2020. ScienceON is a service over the web that provides the knowledge infrastructure needed by researchers in one place by linking and converging science and technology information, research data, information analysis service, and research infrastructure.

As of 2018, NDSL had provided more than 120 million contents in NDSL, such as journal papers, technical reports, patents, and trends for searching and connecting to full-text. According to the 2017 annual report, the NDSL was used over 1 billion times throughout the year in terms of pageviews, and had full-text downloaded approximately 6 million times by users. Users of NDSL were professors, students, and researchers in private companies and public institutes in science and technology fields in South Korea. Users accessed NDSL through the digital library on the web, using portals such as Google and Naver, and other Open APIs from other institutes. However, the data analyzed in this study were limited to the NDSL data accessed through the web. Up to 85% of all NDSL users do not log in to use services and content on NDSL through the web.

The log data were collected and stored on the server. Table 2 shows information about the field of the log master table schema of the NDSL. About 150,000 pageviews of the randomly selected three-day NDSL logs in 2017 and 2018 were extracted and analyzed. There were 49,121 pageviews (32.7%) on September 13, 2017, 39,879 pageviews (26.5%) on January 16, 2018, and 61,750 pageviews (53.8%) on March 12, 2018. Pageviews refer to one usage of the webpage by one user and have become the basic unit of web data analysis. The term 'pageview' referred to is the most frequently used method for measuring the usage frequency for a certain website. Upon examining the frequency of IP usage, redundancies in the volume of use of the NDSL were eliminated for the log data of the three

Table 1. Research procedure and details

Research procedure	Methodology	Research details
Theoretical review	Literature review	▪ Assess the theoretical background and academic context of the research
Analysis of log data	Log pattern analysis	▪ Pattern log analysis of information use path - General usage frequency analysis for content and services - Establish research hypothesis and verify significance using a χ^2 analysis
	Log context analysis	▪ Demographic analysis of identified users ▪ Analysis of usage frequency and cross tables for content and services ▪ Analysis of usage and information-seeking behavior of identified users through the visualization diagram

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Table 2. Log master table schema

Code of field	Name of field	Type
LOGSEQ	Log serial number	Produce (20)
USERID	User ID	Varchar (30)
USERIP	User IP	Varchar (15)
REGDATE	Input date and time	Time
SITECODE	Site code	Varchar (20)
SVCCODE1	Service-main-class	Varchar (10)
SVCCODE2	Service-sub-class	Varchar (10)
USECODE	Application code	Varchar (3)
CCTTCODE1	Content-main-class	Varchar (10)
CTTCODE2	Content-sub-class	Varchar (10)
RETCOUNT	Number of cases	Varchar (10)
COMMENT	Remark	Varchar (50)
YY	Input year	Varchar (4)
MM	Input month	Varchar (2)
DD	Input day	Varchar (2)
HH	Input time	Varchar (2)
LOGSID	Access identifier	Varchar (30)
URL	URL	Varchar (255)
R_URL	Reference URL	Varchar (255)
IP_CNAME	Organization name	Varchar (50)
IP_CITY	City name	Varchar (20)
IP_DISTRICT	District (gu) county (gun) name	Varchar(20)
IP_VILLAGE	Dong name	Varchar (20)
IP_NATION	Country	Varchar (10)
REGIONCODE	Area code	Varchar(2)
PAGECODE	Page code	Varchar (10)
CONTENT_ID	Content serial No.	Varchar (100)
JOURNAL_ID	Content journal serial No.	Varchar (100)
SESSION_KEYWORD	Search formula the given session	Varchar (4000)
SELECT_SEQ	Search result Top-N of selected content	Number
CONTENT_COUNT	Related content count	Varchar (2)
ACCESS_TYPE	Access type	Varchar (2)
LOGCID	Cookie ID	Varchar (255)
LOGSID	Session ID	Varchar (255)

Source: Kim et al. (2013).

days, which resulted in about 22,000 IPs. An IP from public places cannot be regarded as a singular user. Therefore, personal identification is the most accurate means of identifying a user when a person logs data in using an user ID to access the NDSL and then leaves log data.

3. RESULTS

3.1. Usage Statistics

As exhibited across the NDSL, the information-seeking behavior of users can be observed in the following log fields: 'Service-main-class,' 'Service-sub-class,' 'Content-main-class,' and 'Content-sub-class,' expressed by statistics using SPSS Statistics 22 (IBM Co., Armonk, NY, USA). From the log data containing the user log history, the frequent pageviews of September 13, 2017 (32,355 pageviews), January 16, 2018 (9,073 pageviews), and March 12, 2018 (41,242 pageviews), i.e., a total of 82,670 pageviews, were used for information seeking path analysis. More detailed information obtained by frequency analysis of the log data usage is available in Tables 3 and 4. In Table 3, frequently used items selected on a nominal scale for 'Service-main-class' included 'Search,' 'Detailed view,' and 'Full-text view.' Similarly, three frequently used items selected on a nominal scale for 'Service-sub-class' were 'Quick search,' 'Detailed view,' and 'Full-text view.' From 'Service-main-class' to 'Service-sub-class' in Table 3, the path from 'Full-text view' of 'Service-main-class' toward 'PDF full-text view' of 'Service-sub-class' was frequently taken. The main purpose of the NDSL users is to obtain the desired 'Full-text' that satisfies their information needs. Therefore, downloading or viewing a full-text version of a paper on the screen through 'PDF full-text view' is often considered to be the final step in satisfying user information needs. In Table 4, the most frequently used 'Content-main-class' in the NDSL was 'Paper,' while 'Domestic paper' was most frequently used in 'Content-sub-class.'

3.2. Log Analysis of Information-Seeking Behavior: Log Pattern Analysis

This study attempted to determine whether the information behavior link pattern representing the user's in-

Table 3. Frequency of log data usage: service-main-class and service-sub-class (unit: case, %)

Service-main-class	Frequency	Percent %	Cumulative %	Service-sub-class	Frequency	Percent %	Cumulative %
Detailed view	35,621	43.09	43.09	Detailed view	35,621	43.09	43.09
Full-text view	24,482	29.61	72.70	PDF full-text view	19,554	23.65	66.74
				Link to other institutions for full-text	4,928	5.96	72.70
Search	22,567	27.30	100.00	Quick search	22,567	27.30	100.00
Total	82,670	100.00		Total	82,670	100.00	

Table 4. Frequency of log data usage: content-main-class and content-sub-class (unit: case, %)

Content-main-class	Frequency	Percent %	Cumulative %	Content-sub-class	Frequency	Percent %	Cumulative %
Journal	2,488	3.01	3.01	Journal	2,488	3.01	3.01
Paper	59,130	71.53	74.53	All papers	1,8149	21.95	24.96
				Domestic paper	27,367	33.10	58.07
				International paper	6,595	7.98	66.04
				Theses and dissertations	7,019	8.49	74.53
Patent	5,924	7.17	81.70	Domestic publicized patent	2,418	2.92	77.46
				Domestic registered patent	3,506	4.24	81.70
Report	11,772	14.24	95.94	All reports	2,876	3.48	85.18
				Domestic research report	8,896	10.76	95.94
Researcher	3,356	4.06	100.00	Researcher	3,356	4.06	100.00
Total	82,670	100.00		Total	82,670	100.00	

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formation use behavior appears in the log data to answer research question 1 (RQ 1).

- RQ 1: Can general information-seeking behavior patterns be assessed through log pattern analysis of the NDSL?

This study attempted to identify the characteristics of the paths with the link pattern of the moving route. First, users entered the NDSL and used services and content. Then for purposes of this study, the second-stage usage path for the search link log pattern analysis was analyzed, rather the 'Service-main-class' and 'Content-main-class,' followed by the 'Service-sub-class' and 'Content-sub-class.'

3.2.1. Information Seeking Path Analysis: Service-main-class and Content-main-class

Usage frequencies were studied to determine the relationship between variables in the information-seeking path 'Service-main-class' and 'Content-main-class.' Accordingly, a research hypothesis was formulated, and cross-tabulation analysis was performed using the χ^2 Test to determine a group difference or correlation between the attributes of 'Service-main-class' and 'Content-main-class.'

Research Hypothesis 1: There is a difference in the usage frequency of 'Content-main-class' types within the same 'Service-main-class.'

In order to determine the statistical significance of 'Service-main-class' and 'Content-main-class,' the log data for 'Service-main-class' of January 12 was tested. The items 'search,' 'detailed view,' and 'full-text view' were observed to be the most frequently used nominal variables. On the other hand, the more frequently used items in 'Content-main-class' were 'Journal,' 'Paper,' 'Patent,' 'Report' and Researcher.' Based on this sample data, a cross-tabulation analysis was conducted to test the independence of 'Service-main-class' and 'Content-main-class.' The results of the analysis are presented in Table 5. Furthermore, for the test of significance between 'Service-main-class,' and 'Content-main-class,' a cross-tabulation analysis was performed, and the χ^2 value was observed to be statistically significant at the 0.05 level.

As presented in Table 5, 'Detailed view' was most frequently accessed in 'Service-main-class,' followed by 'Full-text view' and 'Search.' In 'Content-main-class,' 'paper' was the most intensely used item, which is also observed to be the most widely used item in 'Search' and 'Full-text view.' This demonstrates that most NDSL services are related to theses and dissertations. This finding can also be confirmed by the log data analysis of the information-seeking paths. The item 'Paper,' which pertains to the content available in the NDSL services, is utilized with various services. Therefore, it is necessary to develop strategies to create more diversified services that use such contents (theses and dissertations), or to identify any negative user experience in existing services to improve the contents or services from the users' perspective.

Table 5. χ^2 test: frequency of content-main-class in the service-main-class

Category			Content-main-class					Total	χ^2
			Journal	Paper	Patent	Report	Researcher		
Service-main-class	Detailed view	Frequency	250	1,667	453	834	337	3,541	1,483.5*
		Expected frequency	98	2,257	246.7	786	153.4	3,541	
	Full-text view	Frequency	-	1,987	179	765	-	2,931	
		Expected frequency	81.1	1,868.2	204.2	650.6	127	2,931	
	Search	Frequency	1	2,129	-	415	56	2,601	
		Expected frequency	72	1,657.8	181.2	577.4	112.7	2,601	
Total		Frequency	251	5,783	632	2,014	393	9,073	
		Expected frequency	251	5,783	632	2,014	393	9,073	

*p<0.05.

3.2.2. Information Seeking Path Analysis: Service-sub-class and Content-sub-class

This analysis investigates and identifies users' information-seeking paths in the log data's 'Service-sub-class' and 'Content-sub-class' shown in the log data. Lower in the hierarchy, located in the lower layer of the corresponding main classification, the sub-classifications of services or contents can be reached by taking a path through the 'Service-main-class' or 'Content-main-class.' To determine if there is a group difference or correlation between the attributes of 'Service-sub-class' and 'Content-sub-class,' a research hypothesis was formulated and then a χ^2 test, i.e., a cross-tabulation analysis was performed.

Research Hypothesis 2: There is a difference in the usage frequency of 'Content-sub-class' types within the same 'Service-sub-class.'

Using the log data of January 12, 2018 as the sample data, a cross-tabulation analysis was performed to test for the group independence of 'Service-sub-class' and 'Content-sub-class.' The results are presented in Table 6. The results of the cross-tabulation analysis, which was conducted to test the significance of 'Service-sub-class' and 'Content-sub-class,' showed that the χ^2 value was observed to be statistically significant at the 0.05 level.

For 'Content-sub-class,' 'Detailed view' was the most frequently used in 3,541 out of 9,073 cases. Users frequently used 'Detailed view' contents, such as 'Domestic paper,' 'International paper,' and 'Theses and dissertations.' 'Detailed view' is a high-frequency service because it allows users to view abstracts and bibliographies or information about authors and references, as well as the full-text version of texts. A close look at the frequency of 'Service-sub-class' and 'Content-sub-class' for each information-seeking characteristic of a path reveals that 'all papers' of 'Content-sub-class' made through 'Quick search' in 'Service-sub-class' was the most frequently used item.

In this path, a brief list of all papers is displayed as the results for 'Quick search,' making it suitable for users who prefer performing a quick search. Another 'Service-sub-class' with a high usage frequency of 'Domestic paper' was 'PDF full-text view.' This path indicates the users' tendency to download a full-text paper after quickly searching and retrieving information with search terms that suit their information needs. In the information-seeking path for 'Service-sub-class' and 'Content-sub-class,' 'Domestic paper' through 'Detailed view' was also popular among users. 'Theses and dissertations' through 'Link to other institutions' for full-text were further observed to be popular among users. User information-seeking paths to access the contents available in other institutions can be observed from 'link to other institutions for full-text,' which is a popular item. Therefore, the process of satisfying user information needs could be identified along the path by analyzing the log data.

3.3. Log Analysis of Information-Seeking Behavior of Identified Users: Log Context Analysis

For the context log analysis, personal information was used in addition to log data to track user information-seeking behavior against the individual's information environment and demographic environment. Users who did not log in to use the NDSL make up 85% of all service users. The log data pattern analysis reviewed information-seeking behaviors based on pageviews without distinguishing individual users. Therefore, use behaviors demonstrated in log data were analyzed based on pageviews to understand the widespread use of the NDSL service. However, as users searched the NDSL individually, it was necessary to conduct a log analysis that focused on the users. Therefore, this paper tried to answer research question 2 (RQ 2) regarding whether contextual information-seeking behaviors can be analyzed from the log data of identified users.

- RQ 2: Can contextual information-seeking behaviors be assessed by analyzing and visualizing the log data created by identified users?

Of the service users studied over three days, the identities of 30 users who performed searches after logging in to NDSL were extracted randomly. Clearer identification of individual users was possible by identifying individuals who used the system by accessing it with their user IDs rather than by distinguishing them through session-by-session log analysis.

3.3.1. Demographic Statistics of Identified Users

The demographic characteristics of users' subjects and preferred information types, identified through the contextual analysis of log data are demonstrated in Table 7. The number of male users was 2.75 times larger than the number of female users among the 30 users selected for the analysis. As for the users' academic fields, seven users (23%) pursued electrical engineering, four users (13%) were in bioengineering, three users (10%) were in computer engineering, and three users (10%) were in medi-

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Table 6. χ^2 test: frequency of content-sub-class in the service-sub-class

Category			Content-sub-class										Total	χ^2
			Journal	All paper	Domestic paper	International paper	Thesis and dissertation	Domestic publicized patent	Domestic registered patent	All reports	Domestic research report	Researcher		
Service-sub-class	Detailed view	Frequency	250	-	795	521	351	168	285	-	834	337	3,541	14,229.4*
		Expected frequency	98	792.7	973	208.4	283	89	157.7	156.1	629.9	153.4	3,541	
	Full-text view	Frequency	-	-	1,632	1	-	-	-	-	758	-	2,391	
		Expected frequency	66.1	535.2	657	140.7	191.1	60.1	106.5	105.4	425.3	103.6	2,391	
	Linking another library	Frequency	-	-	5	-	349	60	119	-	7	-	540	
		Expected frequency	14.9	120.9	148.4	31.8	43.2	13.6	24	23.8	96.1	23.4	540	
	Quick search	Frequency	1	2,031	61	12	25	-	-	400	15	56	2,601	
		Expected frequency	72	582.2	714.7	153.1	207.8	65.4	115.8	114.7	462.7	112.7	2,601	
Total		Frequency	251	2,031	2,493	534	725	228	404	400	1,614	393	9,073	
		Expected frequency	251	2,031	2,493	534	725	228	404	400	1,614	393	9,073	

*p<0.05.

Table 7. Frequency analysis on subjects and preferred information types for 30 users

Subjects					
	Subject area	Frequency	Percent %	Valid percentage %	Cumulated percentage %
Valid	Engineering	18	60.0	60.0	60.0
	Science	6	20.0	20.0	80.0
	Medicine/health	6	20.0	20.0	100.0
	Total	30	100.0	100.0	
Preferred information types					
	Information type	Frequency	Percent %	Valid percentage %	Cumulated percentage %
Valid	Paper	246	40.53	40.53	40.53
	Trend	1	0.16	0.16	40.69
	Report	305	50.25	50.25	90.94
	Journal/proceeding	22	3.62	3.62	94.56
	Patent	31	5.11	5.11	99.67
	Favorite information	2	0.33	0.33	100.00
	Total	607	100.0	100.0	

cine. The 30 logged-in users had 607 pageviews altogether. The 30 identified users and their log data were analyzed to assess whether they demonstrated individually unique information-seeking behavior in their circumstances and/or contextual information needs. The preferred types of information were 246 cases (40.54%) for 'Theses,' 305 cases (50.25%) for 'Report,' and 31 cases (5.11%) for 'Patent.' The type of information NDSL users preferred was analyzed by reflecting the cases where an individual requested more than one type of information. The frequency of 'Patent' or 'Journal' was also not high. On the other hand, 305 cases (50.25%) of 'Report' indicate that 'Report' was the most frequently used. The result showed that the most frequent use of content by identified users was 'Report.' The identified users had a higher preference for 'Report' than for 'Paper.' This shows a different aspect from the overall usage frequency statistics of NDSL in terms of log pattern analysis.

3.3.2. Visualization of Log Context Analysis

This study visualized user information-seeking behavior using log data, since log data was an electronic code and showed the user information-seeking behavior that the user interacted with while accessing NDSL. From the perspective of log analysis, log context analysis included user information and log pattern analysis. It would be desirable to analyze the user's information-seeking behavior based on the model, improve the systems, and provide the preferred information to all users. Since most users accessed the NDSL without logging in, it will be possible to provide various services only after analyzing personal information and researching the use of log information of users who have accessed the system after logging in. Only a few steps are currently presented, but adding various elements will make it possible to create subdivided service conditions that satisfy users.

3.3.3. Creating Visualization Diagram of Log Data

The visualization diagram was applied to User 27's cases, as shown in Fig. 1. This figure visualized the flow of User 27's behavior as time passed when they accessed the NDSL and used the services and content that leave log data. The x-axis shows pageviews, and the flow of time is seen from left to right. The y-axis shows services and content as one set and is displayed as arbitrary numbers. For example, User 27's first pageview in Fig. 1 is labeled 33. Label 33 here means that the user checked the 'Detailed view' and 'Report,' as shown in the center-right of Fig. 1. The user's second pageview was 40, which shows that the content report was viewed through 'Full-text view.' This figure visualizes how User 27 accessed services and content through 21 pageviews.

Microsoft Excel (Microsoft, Redmond, WA, USA) was used to visualize the flow of time, content, and services

 https://doi.org/10.1633/JISTaP.2022.10.1.6

for the visualization diagram. Given the nominal scales of log data, services and content were bundled as shown in Table 8, and an arbitrary number was attached to each pair to create an Excel cross table that visualizes this data. Combinations of seven Service-main-classes and seven Content-main-classes (7×7) resulted in 49 types of service and content pairs, each of which was given an arbitrary number from 1 to 49. Fig. 1 was created based on these categories.

The columns in Table 8 are the commonly used service types, and the rows at the top of the cross table are the list of user content types. The number in each cell shows that the service on the left and the content on the right were used. The service users' patterns of using NDSL can be seen by looking at the category to the left of the number to understand each user's combination of services and content. The content can be seen in the content category from the rows above. For example, the service and content that the user accesses can be understood by checking the number on the line graph in Fig. 1, and then finding the number it corresponds to. For example, number 49 means that the user searched to look up a 'paper'; the number 42 means that the user looked up a 'paper' through 'full-text view.' This information is indicated as numbers on the diagram, showing which service or content was used from the relevant pageview.

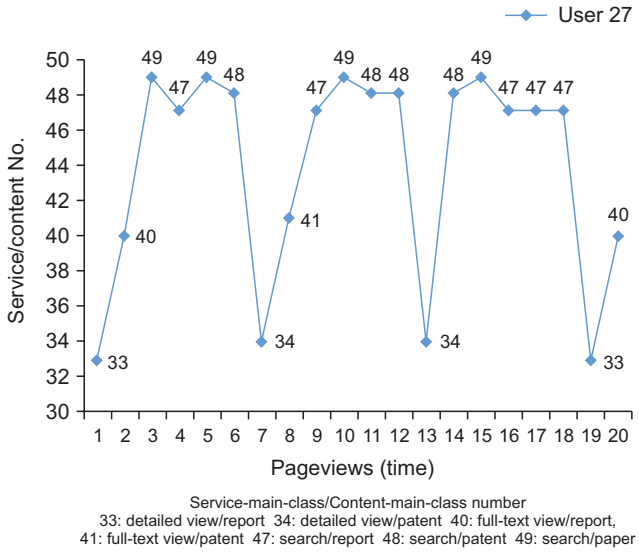


Fig. 1. Visualization diagram of log context analysis: example of User 27.

3.3.4. Application of Visualization Diagram Targeting Identified User on NDSL

The visualization diagram of log context analysis was used for 30 cases as shown in Fig. 2. The lines in the line graph represent the information-seeking behavior of 30 users; these 30 users had different use patterns, and each of their unique information-seeking behavior was visualized through a line. This is consistent with the fact that the information-seeking behaviors of users, which are regarded as the most critical factor in the user study model, are complex according to the situation, context, and social environment and are dynamic according to the context and process. Therefore, the users' information-seeking behaviors may be understood better through a user model rather than a technical description. The x-axis that represents time in the search formula indicates users' information-seeking behaviors over time. The y-axis represents a pair of services and content, and uses an arbitrary number based on the user's type of service and content the user availed. For example, User 3 viewed two 'Papers' through Search' before ending their search. User 2 only looked at 'Paper' using services and content. This shows constant changes in information-seeking behaviors in the line regarding individuality, circumstances, and context, as pointed out in various user studies.

Table 8. Visualization cross table for numbers of service and content pairs

Category	Paper	Patent	Report	Trend	Journal	Researcher	Saved information
Search	49	48	47	46	45	44	43
Full-text view	42	41	40	39	38	37	36
Detailed view	35	34	33	32	31	30	29
Send	28	27	26	25	24	23	22
Document delivery service	21	20	19	8	17	16	15
Translate	14	13	12	11	10	9	8
Save	7	6	5	4	3	2	1

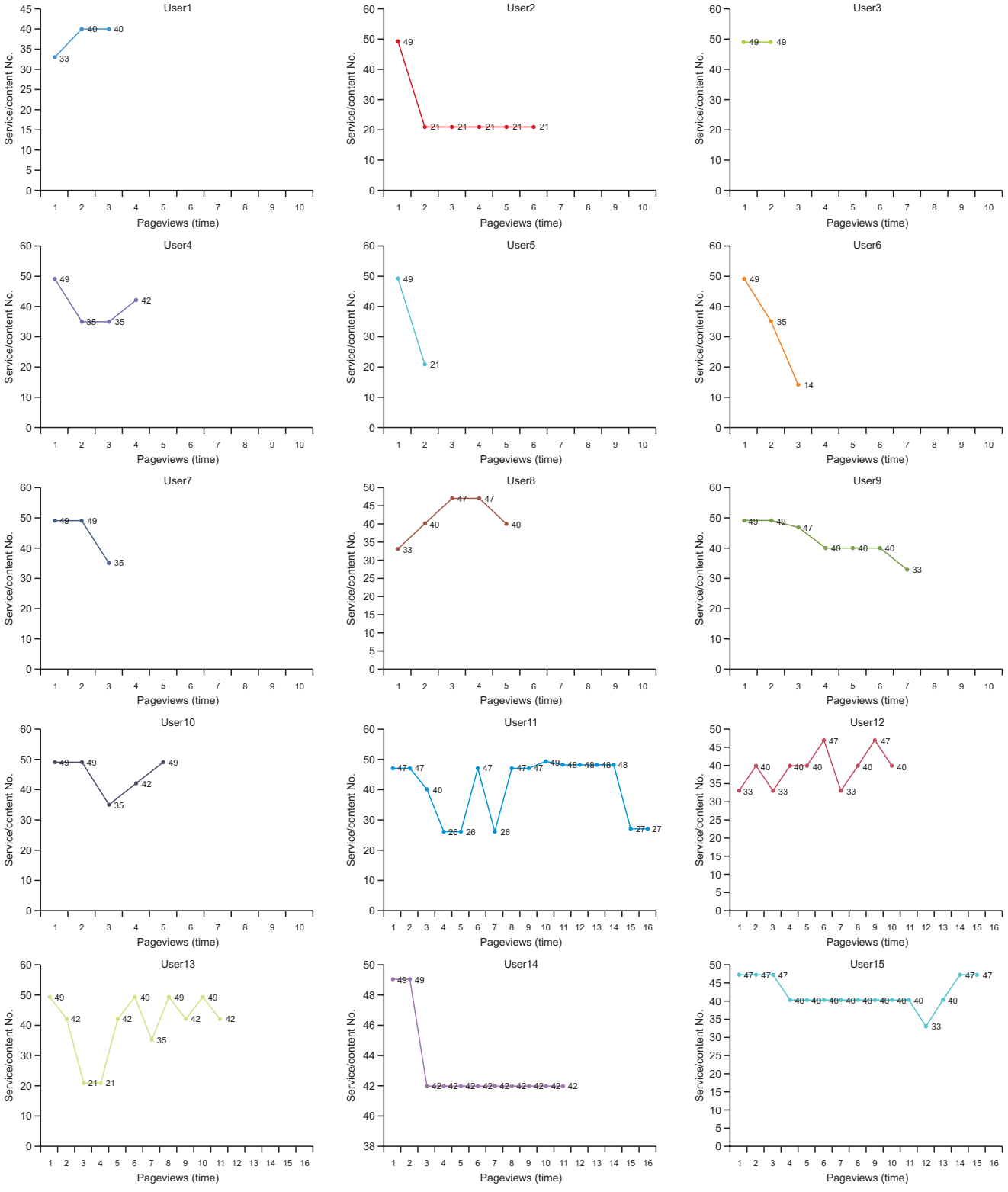


Fig. 2. Visualization diagram of context analysis: 30 users.

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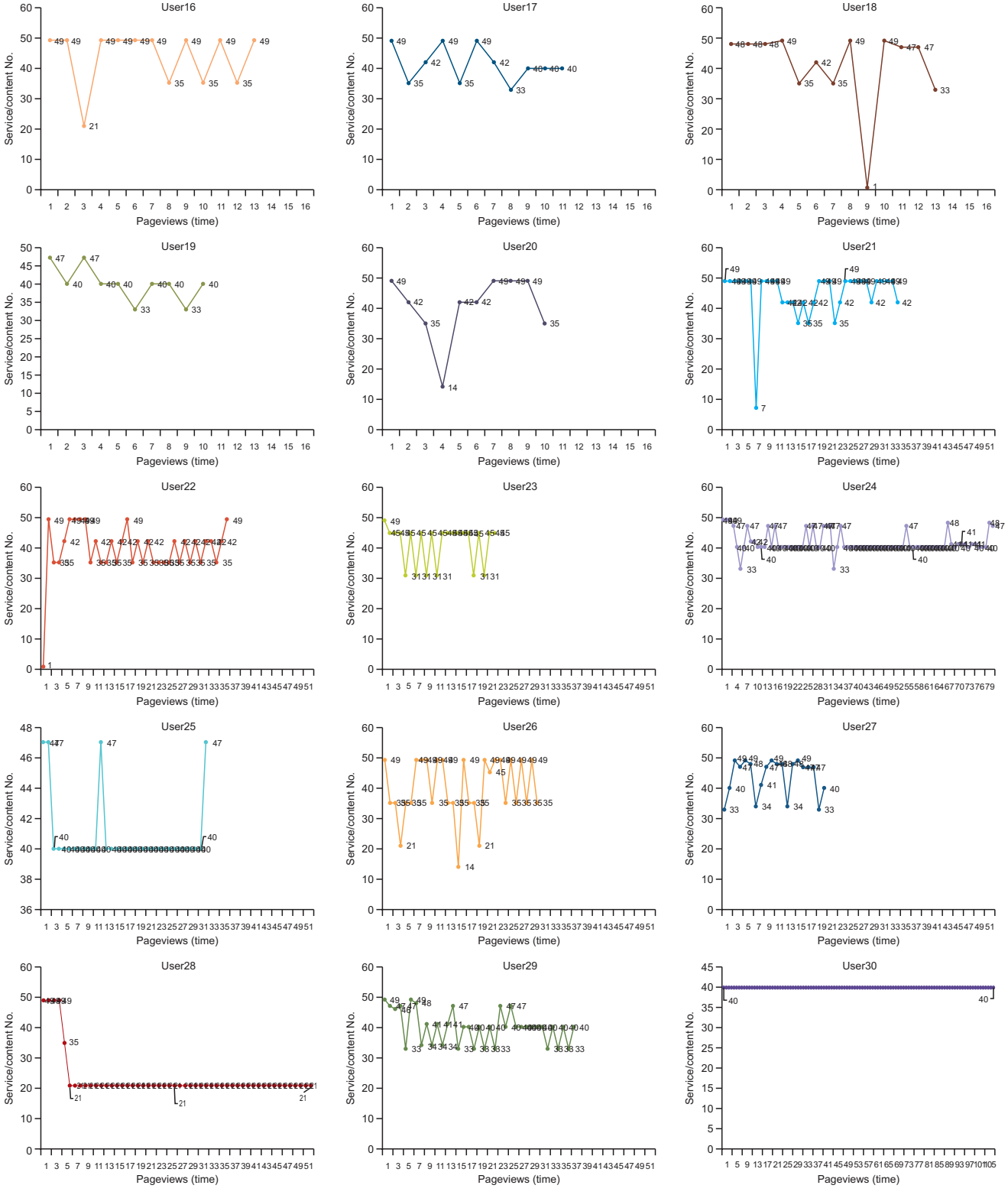


Fig. 2. Continued.

In the future, a method that can group these use behaviors while emphasizing each user's individuality will be sought. With respect to content, users could be grouped into users who prefer 'Papers,' users who prefer 'Reports,' and so on. In terms of services, although there are various types of users, such as those who only use 'Search' and 'Full-text view,' users who typically use 'search,' 'Detailed view,' or 'Full-text view,' and users who use customized services like 'Save' after logging in, if users can be grouped, it would be best to establish a way to provide services based on these groupings. If services can be provided based on understanding the information behavior of users, it will become easier to help users fulfill their information needs.

4. DISCUSSION

Log data from the NDSL were collected randomly and analyzed statistically to answer the two research questions. To conduct an exploratory study on log data that contain the usage records of NDSL users, a log pattern analysis and log context analysis were conducted on the log data. Analyses of the information use path were conducted using log data in pageviews for the log pattern analysis. Pageviews are seen as task units of information use, and they were therefore used as the base unit for data analysis. Log pattern analysis was performed to analyze general usage patterns in the NDSL rather than the patterns for particular individuals. Services and content were divided into main-class and sub-class, and the multi-frequency path was analyzed under these categories: 'Service-main-class,' 'Content-main-class,' 'Service-sub-class,' and 'Content-sub-class.' The correlation between paths was also analyzed through a χ^2 analysis. Logs of users who utilized the NDSL after logging in with their ID were analyzed for the log context analysis. The results of log pattern and context analysis results showed differences in preferred services or content. However, since log pattern analysis is generalized using an average through quantitative analysis, it is necessary to consider the associated limitations of not reflecting individual characteristics.

In the context analysis, users frequently looked up content or services that could only be accessed by logging in. However, the information-seeking behavior of log-in users shown in the log context analysis also revealed the characteristics of a small number of information services that could be overlooked in the overall log data analysis. Therefore, it is desirable to perform a complimentary analysis of the entire log data and the individual user data can be considered in a complementary role as it is possible to analyze the use of NDSL from different angles. Therefore, the results of log context analysis results can be used to assess information behaviors for individuals to provide personalized services that cater to the individual needs of users.

The log pattern analysis and log context analysis were conducted through a frequency analysis to objectify user information-seeking behavior. Log pattern analysis is similar to seeing a forest, and log context analysis is akin to seeing a tree. The log context analysis revealed information-seeking behavior that is not reflected in the pattern analysis, particularly the diversity of information-seeking behaviors and changes in context and circumstances. If the log pattern analysis and log context analysis are not used in conjunction, only a skewed understanding of information-seeking behavior will be obtained. Since the log data tracking analysis applied in this study was useful to assess the patterns and context of user information-seeking behavior, it validates the potential for log data as a method in user studies. In the future, a way may be derived to develop library services and contents through log analyses based on attempts to expand the utilization of log data, and may be developed as a user study method.

This paper provided detailed records and descriptions of the information behavior of individuals who use the NDSL services by analyzing and visualizing user information behaviors that appear in the log data. Three components of duration (time), service, and content were visualized two-dimensionally. The visualization tool is based on Excel; it can be used in similar cases that analyze log data. If user demands and usage patterns are researched through a highly usable log analysis method, it will be possible to make significant contributions to establishing a way to improve and design systems and services. Furthermore, the model should be structured to play a role in showing the dynamics of the information-seeking process according to the users' situations and contexts. The model used in this study was derived inductively through actual log analysis. Visualization by model schematic diagram can be used to understand individuals' distinctive use patterns by making it easy to recognize the information-seeking behavior of NDSL users. It can be said that the usability of log data can be expanded.

Understanding information-seeking behavior through log analysis can increase the usability of log data by expanding the domain in log analysis, focusing on a statistical analysis of the frequency of use or simple frequency analysis of existing query words (Lee et al., 2012; Park & Lee, 2013, 2016). In addition, it is possible to supple-

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ment the usability evaluation conducted in the electronic library to analyze the information-seeking behavior of users. Since the usability evaluation targets some users, the results may be slightly distorted, but log data analysis is more likely to reflect the characteristics of the entire population of users since it is analyzed for all users. Log usage tracking analysis can be performed with existing log data, which is inexpensive. User research through log analysis has the advantage of analyzing realistic user information pursuit behaviors of users without falsehood. In addition, the log data provides clues to the users' contextual understanding, as this essential element of user research can track their situation and context.

There is an increasing number of libraries introducing log analysis systems or attempting log analysis using Google Analytics. However, there are cases in which log analysis is of limited use. It does not provide much help in grasping the user information-seeking behavior. Furthermore, there are many cases in which log data is not fully utilized. This study attempted to examine the extent to which log data reveals information-seeking behavior and how much we can use the log. Since log data is an electronic sign of the information-seeking behavior of the users of the corresponding digital library, if this sign is well interpreted and analyzed properly, the user information-seeking behavior can be analyzed in various ways (Jansen et al., 2009; Park & Lee, 2013; Peters, 1993). Based on this, the contents or services desired by users can be better provided, so the usability of the log can be improved.

A limitation of this study was that the dataset was limited to the data from three days of using a digital library providing information resources for science and technology. Therefore, the results of this study may not apply to general cases. Consequently, it is necessary to have a contextual understanding of the model's content analyzed by the log system, the characteristics of users, and the provided content. Moreover, the proportion of users who log in may be smaller than that of university libraries or research institutions. Since information behaviors may differ depending on the structure of the digital information service, any attempts to apply the model to other digital library services must be preceded by a thorough review.

5. CONCLUSION

Libraries are making efforts to improve their services and systems using log data, which are traces of interactions between users and systems. This study expanded the scope for utilization of log data by exploring its potential as a user study method. For this purpose, the study developed a new model that can extract the contextual and detailed characteristics of information-seeking behavior. Analysis of the transaction log of the digital library's services and content indicated the users' information search behaviors and provides insight into users' information needs, information usage patterns, and search and access methods. The majority of users' overall access pattern and information-seeking behavior was analyzed through log pattern analysis. The specific users' information-seeking behavior was complemented by log context analysis. Based on the configuration of the information-seeking behavior derived through exploratory research, a visualization tool showing the users' research situation and situation characteristics was built. Surveys or in-depth interviews, which are conducted by digital library librarians to provide information services tailored to the user's information needs, require time and considerable cost. There is also a limited sample size. On the other hand, log data can provide accurate information on users' information search behavior, which is the basic data necessary to improve and design library information services and systems, so it can be an efficient tool to grasp users' information pursuit behaviors. By tracking, analyzing, and linking the components of various types of log data provided by the log system, it will be possible to grasp the contents of the richer user information-seeking behavior in more detail. The results of log analysis for information-seeking behavior can enhance the understanding of users. Therefore, it can be utilized as the basic data to improve the design of digital library services and systems for users.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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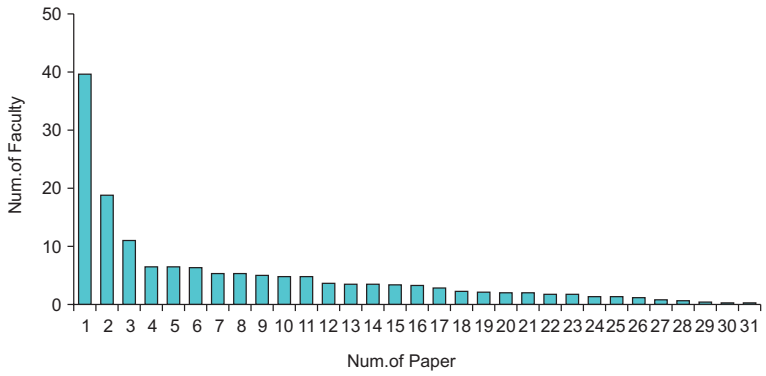


Fig. 1. Distribution of authors over publication count.

Table

Table 1. The title of table goes here

Study	Time period study	Data
Smith Wesson (1996)	1970 - 1995	684 papers in 4 SSCI journals
Reeves [a (2002)	1997 - 2001	597 papers in 3 SSCI journals
Jones Wilson [b (2011)	2000 - 2009	2,166 papers in 4 SSCI journals

[a Table footnote a goes here
[b Table footnote b goes here

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Book chapter

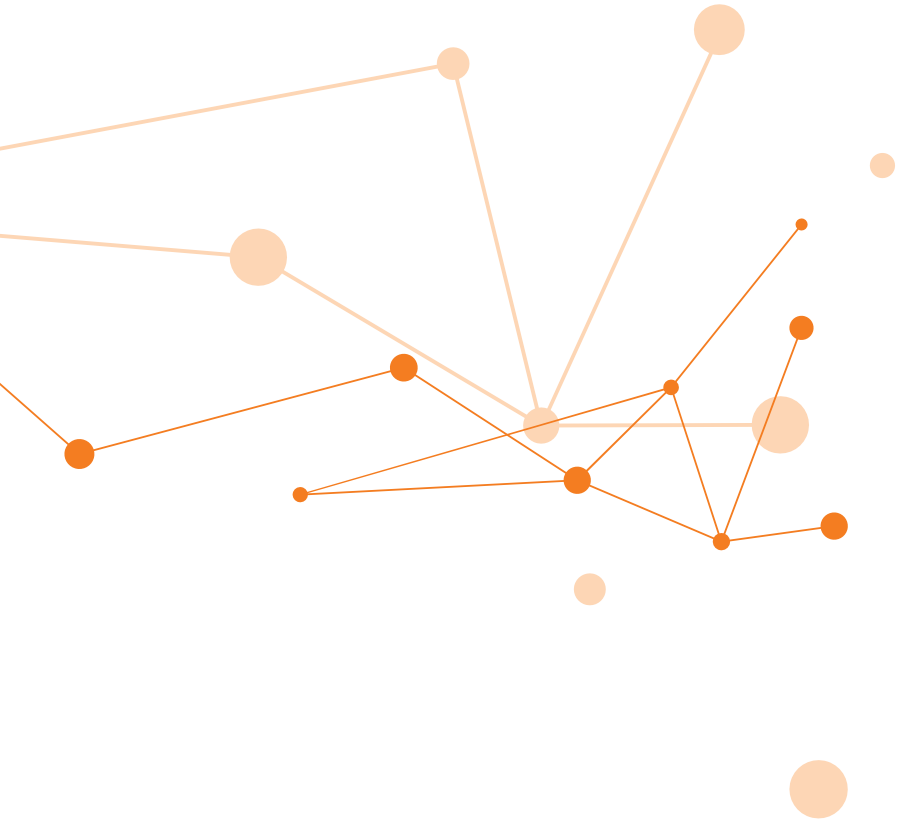
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