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# Journal of Information Science Theory and Practice

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## JISTaP

- 01 Investigating the Impact of Value Co-Creation on Satisfaction and Intention to Adopt E-Resources
- 16 Constructing a Conceptual Electronic Record Management System Model Based on *Eight Indonesian Education Standards* to Support School Accountability
- 29 Research on the Discourse of Libraries During COVID-19 in YouTube Videos Using Topic Modeling and Social Network Analysis
- 43 Knowledge Graph of Administrative Codes in Korea: The Case for Improving Data Quality and Interlinking of Public Data
- 58 Virtual Internship Experiences of Library and Information Science Students During the Pandemic
- 79 Pagoda Data Management and Metadata Requirements for Libraries in Myanmar

### Aims and Scope

*The Journal of Information Science Theory and Practice (JISTaP)* is an international journal that aims at publishing original studies, review papers and brief communications on information science theory and practice. The journal provides an international forum for practical as well as theoretical research in the interdisciplinary areas of information science, such as information processing and management, knowledge organization, scholarly communication and bibliometrics. JISTaP will be published quarterly, issued on the 30th of March, June, September, and December. JISTaP is indexed in the Scopus, Korea Science Citation Index (KSCI) and KoreaScience by the Korea Institute of Science and Technology Information (KISTI) as well as CrossRef. The full text of this journal is available on the website at <http://www.jistap.org>

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### Articles

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- 01 Investigating the Impact of Value Co-Creation on Satisfaction and Intention to Adopt E-Resources

Sachin Kumar, Adil Zia, Vandana, Vinod Kumar



- 16 Constructing a Conceptual Electronic Record Management System Model Based on *Eight Indonesian Education Standards* to Support School Accountability

Nina Oktarina, Murwatiningsih, Hana Netti Purasani, Ahmad Sehabuddin, Edy Suryanto



- 29 Research on the Discourse of Libraries During COVID-19 in YouTube Videos Using Topic Modeling and Social Network Analysis

Euikyung Oh, Ok Nam Park



- 43 Knowledge Graph of Administrative Codes in Korea: The Case for Improving Data Quality and Interlinking of Public Data

Haklae Kim



- 58 Virtual Internship Experiences of Library and Information Science Students During the Pandemic

Daniel Jr. Soriano Balbin, Russell Battad Dolendo



- 79 Pagoda Data Management and Metadata Requirements for Libraries in Myanmar

Tin Tin Pipe, Kulthida Tuamsuk

- 92 **Call for Paper**
- 

- 93 **Information for Authors**
-

# Investigating the Impact of Value Co-Creation on Satisfaction and Intention to Adopt E-Resources

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## ABSTRACT

The present study examines the impact of value co-creation on satisfaction and intention to adopt of e-resources among users. Four components of the DART model have been adopted to describe value co-creation. These components are dialogue, access, risk-assessment, and transparency. Ph.D. scholars and faculty members from National Capital Region, India, were requested to respond on a five-point Likert scale. A total of 220 responses were collected with the help of a structured questionnaire from respondents of the top 50 business schools according to National Institute Ranking Framework. These responses have been analysed by means of structured equation modelling on Adanco 2.2 software. Findings of the study reported the insignificant impact of access and risk-assessment, and positive impact of dialogue and transparency on satisfaction. Further, satisfaction has been identified, creating significant impact on adoption of e-resources. Such findings reflect the real picture of customer experience with respect to their role in co-creation of e-resources. Respondents have conveyed their dissatisfaction with the co-creation process of e-resources, as companies do not provide all the information and access to their customers beforehand. Consequently, customers fail to make informed decisions and also find themselves unable to show trust in the service providers of e-resources.

**Keywords:** co-creation, DART model, e-resources, user satisfaction, value co-creation, online library

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## 1. INTRODUCTION

Value can be demarcated as “the capacity of goods, services or activity to satisfy a need or provide a benefit to a person or legal entity” (Haksever et al., 2004). Various researchers have explained value co-creation in context to marketing, service, interaction, design, and innovation and new product development. The development of new products in a market is determined by recognizing the true requirements of customers and modifying existing products in accordance to the needs and requirements of customers (Bharti et al., 2014). To develop an innovative product, firms are working day and night in identifying innovative ideas. Therefore, engaging consumers in the process of product development is gaining popularity. Further, to gain competitive advantage, co-creation is emerging as a good idea and is also being considered as the foremost objective of companies. Co-creation has been defined as an approach to generate novice ideas for consumers and by consumers (Hoyer et al., 2010).

In other words, value co-creation is the experiential relationship between customer and firm which also affects consumer judgements about service delivery (Manser Payne et al., 2021), as the customer personally enhances the value of a product or service by being involved in and developing the entire service delivery process (Grönroos, 2012). This co-created value leads to higher customer engagement (Ramaswamy & Guillaud, 2010; van Doorn et al., 2010) through customer experiences (Ramaswamy, 2008). Yet, besides travelling (Smaliukiene et al., 2014) and scale validation (Albinsson et al., 2016; Taghizadeh et al., 2016), very little attention has been noticed in examining the intention to use e-resources among academicians and research scholars in higher education institutions.

Thus, this study represents one of the preliminary research endeavors, which shows the contribution of the DART model of value co-creation in developing e-resources. Previous studies have extended the DART model in various disciplines, like social media (Schiafone et al., 2014; Wan Ahmad et al., 2018), education (Fagerström & Ghinea, 2013), government e-services (Adeleke & AbdulRahman, 2011), savings groups (Sithole et al., 2021), travel services (Smaliukiene et al., 2014), online retailing (Anshu et al., 2022), and multi-industry contexts (Oklevik et al., 2022). However, as far as researcher knowledge is concerned, none of the studies have employed this DART framework with respect to e-resources. To fulfil this gap, the current investigation aimed to examine the impact of value co-creation in evolving user satisfaction as well as

the intention to adopt e-resources.

As far as the structure of the present research is concerned, it starts with an introduction by elaborating the significance of this study in the area of value co-creation and e-resources. Further, it extensively reviews and presents the literature on key concepts such as value co-creation, the DART model of value co-creation, and e-resources. The insights gathered from literature review guided in the formulation of research objectives and hypotheses. Further, this study moved toward drafting the research methodology to define the research design along with the instrument and process of data collection. Finally, the study ends with data analysis, discussion, and a conclusion. The uniqueness of the study lies in the last section of the study, which highlighted the implications for academicians, librarians, and e-resource providers. In addition, limitations and scope for future research have also been explicated.

## 2. REVIEW OF LITERATURE

### 2.1. Value Co-Creation

Co-creation can be defined as an “organization’s creativity or a form of commercial strategy, that brings different stakeholders together like ‘a company and a customer’ in order to cooperatively develop a product which satisfies customers as well as earns profits for the company”; Prahalad and Ramaswamy (2004b) further added in definition of co-creation that “it is the joint creation of value by the company and the customer; allowing the customer to co-construct the service experience to suit their context.” Moreover, in the process of co-creation, organizations leverage their own customers for product development (Saarijärvi, 2012). The voluntary involvement of customers in the businesses process, utilising either common or private resources, will ultimately produce significant consequences for the company, particularly having an impact on revenue (Krishna & Dhaka, 2013). In this process, value is jointly created by customers and service providers through engagement (Komulainen, 2014). Further, co-creation has been seen as an important antecedent in the service sector (Jaakkola et al., 2015) and is emerging as a forthcoming area of research (Cheung et al., 2021; Manser Payne et al., 2021; Nadeem et al., 2020; Ratten, 2022; Saha et al., 2020; Yen et al., 2020).

### 2.2. DART Model of Value Co-Creation

To understand variables such as satisfaction and intention to adopt e-resources, a DART model, put forth by

Prahalad and Ramaswamy (2004a; 2004b), has been employed. This model elucidates the process of co-creation of values in terms of four types of company-customer communications (Schiavone et al., 2014). This model is found to be the best framework to understand and explain the values created by both customer and company (Shen et al., 2018). A meaningful dialogue requires the access of customers to the resources. Beyond these variables, an effective risk assessment is important for providing the information about risk associated with value co-creation. Similarly, transparency in sharing information with customers is also found necessary to add value (Albinsson et al., 2016), since the DART model's fundamental tenet is predicated on the supposition that the market is made of certain co-created experiences which companies and customers share to develop new products and services (Schiavone et al., 2014). The concept of value co-creation has been emerged to deliver the same.

### 2.3. E-Resources

The usage and adoption of e-resources are increasing tremendously (Sivathaasan et al., 2014), and is expected to rise in the near future (Sampath Kumar & Kumar, 2010). One of the evident reasons for the popularity of e-resources is its up-to-date information delivery and anywhere 24/7 access (Haridasan & Khan, 2009). E-resources mean information processing via electronic media in the form of e-books, online journals, or digital libraries (Sudhier & Seethalekshmi, 2011). According to Haridasan and Khan (2009), e-resources include different categories of online databases, e-journals, e-books, and Internet resources. Where academic journals are helpful in teaching and research works for academicians (Monopoli et al., 2002; Rani & Zainab, 2006), e-books and digital libraries are proved to be helpful for students (Fojtik, 2015; Morris & Lambe, 2017; Walton, 2014), and academicians both (Sampath Kumar & Kumar, 2010). It has been identified in a study that these teachers and students use e-resources either by a learning and doing method or after advice from their friends (Sampath Kumar & Kumar, 2010).

Further, the review of prior literature reveals that e-resource usage was an important research choice among scholars (Falloon & O'Reilly, 2020; Haridasan & Khan, 2009; Isibika & Kavishe, 2018; Monopoli et al., 2002; Sampath Kumar & Kumar, 2010; Sivathaasan et al., 2014; Sudhier & Seethalekshmi, 2011; Rani & Zainab, 2006; Tella et al., 2018). However, some scholars have utilized certain theories such as the "Diffusion of Innovation Theory" (Joshua & King, 2020), "unified theory of acceptance and

use of technology" (Chang et al., 2015), and models like Performance Evaluation Model (Noh, 2012) in e-resource related research endeavour. Moreover, previous studies have examined the usage of electronic resources in libraries only and very less focus has been placed on employing components of value co-creation in developing e-resources for academicians and scholars.

## 3. OBJECTIVES AND HYPOTHESES FORMULATION

Two research objectives have been formulated with the help of previous research. These are:

- To identify the most influencing component of value co-creation in generating user satisfaction of e-resources.
- To investigate the impact of satisfaction on the user's intention to use e-resources.

The following objectives of the study provided directions for drafting the hypotheses of the study:

### 3.1. Dialogue

Dialogue means communication, keen participation, and willingness to take action. Dialogue creates a loyal community by active learning and interaction, which is more than just listening to customers (Mohd Idros et al., 2018; Prahalad & Ramaswamy, 2004a; 2004b). Lusch and Vargo (2006) have defined dialogue as a conversation which helps both firm and customer to learn about the necessities and capabilities of each other. This active dialogue between the customer and provider creates value (Albinsson et al., 2016). Russo Spina et al. (2012) have defined dialogue as a three-way relationship, i.e., between firm and customer, among various customers, and between consumer and expert. It is said that the better the quality of dialogue, the better will be the customer co-created experience (Binkhorst & Den Dekker, 2009), and better customer experience will help in forming better customer satisfaction (Choi et al., 2013; Iglesias et al., 2019; Khan et al., 2015). Considering the findings of previous research, it is hypothesised that:

*H1: Dialogue with e-resource users has a positive influence on user satisfaction.*

### 3.2. Access

Access has been described as the availability of infor-

mation to customers that helps them in co-creation of value (Adeleke & AbdulRahman, 2011) by using accurate tools of communication (Mazur & Zaborek, 2014; Russo Spena et al., 2012). According to Ramaswamy (2005), “Accessibility of the consumers to service processes gives them an opportunity to be engaged in the design, development, setting price process and quality processes across the value network” (cf: Taghizadeh et al., 2016). Further it has been quoted that “In order to foster such a complex dialogue, a company must provide its customers with access to each other and to company listeners” (Ramaswamy, 2008). The access of a firm’s information resources increases the experience of customers (Solakis et al., 2017). Further, this experience influences them to facilitate the development of products and services (Pralhad & Ramaswamy, 2001). Although a handful of research efforts have revealed the positive role of customer experience in generating satisfaction among consumers (Choi et al., 2013; Iglesias et al., 2019; Khan et al., 2015), none of the research has cited the role of access in generating satisfaction and intention to adopt e-resources. Thus, we hypothesize that:

*H2: Access of e-resources has a positive influence on user satisfaction.*

### 3.3. Risk Assessment

Risk assessment means the probability of risk associated with the product or service (Smaliukiene et al., 2014): “Risk assessment guidelines consider how to manage the risk/benefit proposition for both the customer and the company” (Ramaswamy, 2008). When the consumer acts as co-creator, he/she wishes to acquire additional information related to the potential risk linked with not only the development of products/services but also the consumption and distribution of the same (Ramaswamy, 2005). The customer accesses the risk information based on ranking, comments, reviews, etc. (Smaliukiene et al., 2014). The risk associated in services needs to be disclosed to help customers in order to facilitate their informed decisions (Adeleke & AbdulRahman, 2011). The informed decision will eventually create trust between company and customer (Pralhad & Ramaswamy, 2004c) that significantly contributes to the satisfaction of consumers (Park et al., 2017). Hence, it is posited that:

*H3: Risk assessment of e-resources has a positive influence on user satisfaction.*

### 3.4. Transparency

Transparency means the openness of information regarding the products and technologies of the service provider (Smaliukiene et al., 2014). In the simplest and shortest manner, it can be comprehended as “shared information” (Ramaswamy, 2008). A well-informed consumer is considered to be more participative in the processes of the company (Pralhad & Ramaswamy, 2004c). These consumers have the freedom to reveal their feedback among the public (Smaliukiene et al., 2014). According to Adeleke and AbdulRahman (2011), transparency in services facilitates the co-creation of value. Thus, transparency is found to be an important variable in defining satisfaction. Prior studies have also supported the association between transparency and satisfaction and validate the role of transparency in evolving customer satisfaction (Eggert & Helm, 2003; Hegwer, 2015; Khosroshahi et al., 2019; Simintiras et al., 2015). Thus, the following hypothesis is proposed:

*H4: Transparency in e-resources has a positive influence on user satisfaction.*

### 3.5. Satisfaction and Intention to Adopt

Satisfaction refers to “positive attitudes toward using the system” (Joo & Lee, 2011). Customer satisfaction facilitates service providers not only in building human behaviour but also in retention (Tussyadiah, 2016). Satisfaction has also been quoted as the strongest predictor for the continuance intentions of humans, essentially in the context of new technologies (Bhattacharjee, 2001). A satisfied customer exhibits a greater intention towards the products and services of a firm (Kim et al., 2009). Previous research as well elucidated an influential role of satisfaction in consumer adoption intention studies (Agrebi & Jallais, 2015; Belanche et al., 2012; Kumar et al., 2022; Revels et al., 2010). Thus, it is proposed:

*H4: Satisfaction of users has a positive influence on intention to adopt e-resources.*

## 4. RESEARCH METHODOLOGY

### 4.1. Research Design and Questionnaire

In the present study, a survey method was adopted to test the theoretical constructs. The data from respondents were gathered using a verified DART model scale. The measurement items of the DART model were taken from Taghizadeh et al. (2016) and Albinsson et al. (2016).

A five-point Likert scale was used to determine the responses, categorising all the responses from *strongly agree* to *strongly disagree*. The Dialogue (6 items), and Risk Assessment and Transparency (5 items each) were adopted after modifications from Taghizadeh et al. (2016). Access (3 items) items were modified from Albinsson et al. (2016). Satisfaction (3 items) were adopted after modifications from the work of Joo and Lee (2011). Behavioral Intention (3 items) were taken from Fishbein and Ajzen (1975) and Shankar and Rishi (2020). Combining all these, a total of 25 items were taken for gathering data and further analysis. The questionnaire was administered in the English language and the pilot testing was performed on 20 respondents. To avoid repetition of results the pilot testing responses were not incorporated into the final sample.

#### 4.2. Data Collection

The target population in the present study was Ph.D. scholars and faculty in the National Capital Region (NCR) of India. In line with previously published research (Madhusudhan, 2010), the present study adopted a descriptive research design by following two stage sampling. In the first stage, the top 50 business schools as per the National Ranking Framework (Ministry of Education) situated in the NCR (India) were chosen using judgemental sampling, based on the assumption that these institutes subscribe to the best e-resource platforms (Kumar et al., 2016; 2022). In the second stage, respondents were chosen using simple random sampling for data collection (Kumar et al., 2022). A total of 220 Ph.D. scholars and faculties, belonging to seven institutions situated in NCR, responded to the questionnaire. Table 1 describes the demographic information of the respondents. The data clearly shows that 65% of the responses were male. Most respondents (61.36%) were below the age of 35 years, 32.73% of the respondents were 35-45 years of age, and only 5.91% were from the age of 45 years and above. When respondents were asked about their familiarity towards e-resources, it was found that 66.82% of respondents were extremely familiar with e-resources, while 30.00% were moderately familiar, and only 3.18% mentioned themselves as less familiar.

## 5. DATA ANALYSIS AND RESULTS

Adanco 2.2 software (Informer Technologies, Inc.) was used for data analysis (Henseler & Dijkstra, 2015; Rasoolimanesh et al., 2019). For analysing the relationship among selected constructs, partial least square structural equation

**Table 1.** Demographic profile of respondents (n=220)

Category	n (%)
<b>Sex</b>	
Male	153 (69.55)
Female	67 (30.45)
<b>Age (yr)</b>	
<35	135 (61.36)
35-45	72 (32.73)
>45	13 (5.91)
<b>Institutions</b>	
Indian Institute of Technology, Delhi	17 (7.72)
Management Development Institute, Gurugram	19 (8.64)
Indian Institute of Foreign Trade, New Delhi	28 (12.73)
Amity University, Gautam Budh Nagar, Noida	37 (16.82)
Jamia Millia Islamia, New Delhi	21 (9.54)
International Management Institute, New Delhi	57 (25.91)
Institute of Management Technology, Ghaziabad	41 (18.64)
<b>Familiarity with e-resources</b>	
Extremely familiar	147 (66.82)
Moderately familiar	66 (30.00)
Less familiar	7 (3.18)

modelling has been applied. The data analysis has been performed and presented with the help of a measurement model and structural model (Henseler et al., 2009).

#### 5.1. Measurement Model

Firstly, the measurement model was evaluated for testing the reliability and validity of the collected responses. The reliability was tested using construct and indicator reliability, whereas validity was checked through convergent and discriminant validity. The construct reliability was tested by composite reliability (CR) and Cronbach's alpha value. As mentioned in Table 2, dialogue and transparency constructs scored Cronbach's alpha value above 0.7, which is the minimum required value (Hair et al., 2010). However, access was able to meet the minimum threshold value (which is above 0.65) defined by Nunnally (1978). The values of CR were also calculated as above the threshold values 0.70 (Fornell & Larcker, 1981; Hair et al., 2010; 2018). These results have confirmed the reliability of the entire list of constructs. Further, the values of factor loadings were above the threshold value, i.e., 0.4 (Henseler et al., 2009) and 0.5 (Hair et al., 2010), confirming the

**Table 2.** Summary of measurement model

Construct	Item	Statement	AVE	CR	FL	Chronbach's $\alpha$
Dialogue	D1	Use diversified communication channels to have dialogue sessions with e-resource users	0.5114	0.8197	0.6506	0.8089
	D2	Conduct dialogue session with e-resource users frequently			0.6684	
	D3	Involve internal parties during the dialogue session with e-resource users			0.7381	
	D4	Involve external parties during the dialogue session with e-resource users			0.7777	
	D5	Recognize the e-resource user's experience regarding to e-resources			0.6841	
	D6	Emphasize the employees' effort to individual e-resource users			0.7622	
Access	A1	The e-resources websites lets the user decide how he/she receives the e-resource offering	0.5895	0.7441	0.5711	0.6760
	A2	The user has many options to choose how he/she experiences the e-resources service/product offering			0.8643	
	A3	It is easy for the user to receive the e-resource service/product offering when, where, and how he/she wants it			0.8339	
Risk assessment	R1	Inform potential risks of the service product offered to e-resource users	0.6875	0.9782	0.7848	0.8917
	R2	Inform e-resource users about the limitation of the firm's knowledge and capability			0.8595	
	R3	Recognize the changing dynamics of e-resource users' needs			0.9190	
	R4	Accept e-resource users' complaints on service product offerings			0.8587	
	R5	Shoulder all the risk-related responsibilities upon themselves			0.7077	
Transparency	T1	Make clear to the users about the e-resource service product-related information	0.5243	0.7688	0.7951	0.7704
	T2	Disclose pricing related information to e-resource users			0.7795	
	T3	Get benefit from the information symmetry between users and the e-resources platform			0.6210	
	T4	Build trust among users through transparent information			0.7106	
	T5	Provide up-to-date information to users			0.7009	
Satisfaction	S1	I am satisfied with this digital library overall	0.6293	0.7184	0.7932	0.7052
	S2	It is a pleasure to use this digital library to find what I want			0.8487	
	S3	I am comfortable and feel fulfilled while using this digital library			0.7337	
Intention to use e-resources	IU1	I intend to use e-resources in the future	0.7662	0.8475	0.8782	0.8471
	IU2	I expect that I will use e-resources in the future			0.8491	
	IU3	I plan to use e-resources in the future			0.8979	

AVE, average variance explained; CR, composite reliability (Dijkstra-Henseler's rho [ $\rho_A$ ]); FL, factor loading.

reliability of all indicators. Adding to this, the convergent validity was analyzed using the average variance explained (AVE) which was found to be above the threshold value of 0.50 (Fornell & Larcker, 1981; Hair et al., 2010; 2018; Henseler et al., 2009).

Further, the heterotrait-monotrait ratio (HTMT) and Fornell-Larcker criterion were used to assess the discriminant validity of each construct (Table 3). Previous studies suggest that the value of HTMT above the threshold value reflects a lack of discriminant validity (Henseler et al., 2015). In present research the HTMT values were below the threshold value, i.e. 0.90, which proves the discriminant validity of the constructs (Gold et al., 2001; Hair et al., 2018). For the Fornell-Larcker criterion the square root of AVE needs to be greater than the correlation between the constructs (Fornell & Larcker, 1981). Since both the criteria fulfilled the requirement of discriminant validity conditions, it can be ascertained that discriminant validity was achieved. The values of variance inflation factor (VIF) were analyzed to evaluate the collinearity in the responses (Table 4). The result of the analysis shows the VIF values are falling within the range of 1.2 to 3.1 for all the items which are far below than benchmark value of 10, indicating no problem of multicollinearity (Hair et al., 2018).

The model fit was assessed with the help of standardized root mean square residual (SRMR) value, unweighted least squares discrepancy ( $d_{ULS}$ ), and geodesic discrepancy

( $d_G$ ) values, using Adanco 2.2 software (Ashiru et al., 2022; Dijkstra & Henseler, 2015; Henseler, 2017; Henseler et al., 2016). However, most researchers consider SRMR as an approximate measure of model fit (Benitez-Amado et al., 2017; Hu & Bentler, 1998; Oh, 2022; Seetharaman et al., 2017) and  $d_{ULS}$  and  $d_G$  values as overall model fit (Benitez-Amado et al., 2017). For the data to be fit with the model, the SRMR value needs to be under 0.08 (Henseler et al., 2016; Oh, 2022). Our estimated model fit value for SRMR was 0.0739, which falls below the cut-off value, thus representing a model fit (Table 5). Moreover, the values of  $d_{ULS}$  and  $d_G$  are less than their corresponding HI95 and HI99 values, representing an overall model fit (Henseler, 2017; Henseler et al., 2016).

## 5.2. Structural Model

After achieving reliability and validity, the next step of analysis was to validate the structural model. Thus, to test the relationship between dependent and independent variables as proposed in the measurement model, the bootstrapping procedure using 4,999 subsamples was performed, which is also helpful in validating the theoretical model of the study (Hair et al., 2018).

The value of  $R^2$  represents the impact of independent variables on dependent ones. Analysed results show that 50.4% variation in user satisfaction has been observed due to all the variables of the DART model. A further 47.2%

**Table 3.** Discriminant validity

Construct	Dialogue	Access	Risk-assessment	Transparency	Satisfaction	Intention to adopt
Heterotrait-monotrait ratio						
Dialogue						
Access	0.7572					
Risk-assessment	0.0575	0.0095				
Transparency	0.8458	0.7139	0.0444			
Satisfaction	0.8203	0.6050	0.0406	0.8859		
Intention to adopt	0.7539	0.5654	0.0201	0.7720	0.8848	
Fornell-Larcker criterion						
Dialogue	0.5114					
Access	0.3936	0.5895				
Risk-assessment	0.0029	0.0013	0.6875			
Transparency	0.4500	0.3252	0.0011	0.5243		
Satisfaction	0.4016	0.2286	0.0009	0.4387	0.6293	
Intention to adopt	0.4006	0.2449	0.0005	0.3889	0.4725	0.7662

Squared correlations; average variance explained in the diagonal.

**Table 4.** Variance inflation factor

Indicator	Dialogue	Access	Risk-assessment	Transparency	Satisfaction	Intention to adopt
D1	1.4123					
D2	1.5249					
D3	1.5589					
D4	1.8413					
D5	1.4384					
D6	1.6251					
A1		1.2985				
A2		1.5499				
A3		1.2995				
R1			2.8127			
R2			3.1113			
R3			2.9610			
R4			2.2933			
R5			1.5227			
T1				1.7868		
T2				1.6927		
T3				1.1780		
T4				1.4441		
T5				1.5776		
SS1					1.3676	
SS2					1.5302	
SS3					1.3220	
II1						2.2065
II2						1.7935
II3						2.3910

**Table 5.** Model fit indices

	Value
SRMR	0.0739
$d_{ULS}$	1.7742
$d_G$	0.5924

SRMR, standardized root mean square residual;  $d_{ULS}$ , unweighted least squares discrepancy;  $d_G$ , geodesic discrepancy.

variation in behavioural intention to use e-resources has been noticed due to user satisfaction of e-resources (Table 6).

The hypotheses related to DART and satisfaction H1 (path coefficient [PC]=0.332,  $p<0.01$ ) and H4 (PC=0.424,

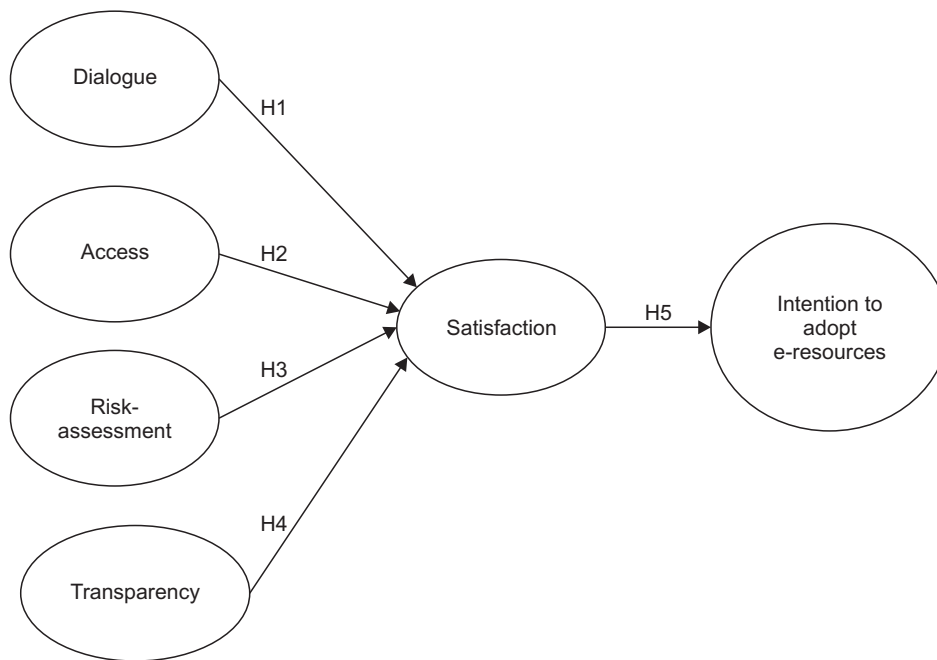
$p<0.01$ ) were supported, showing a positive relation between dialogue to satisfaction and transparency to satisfaction, respectively. Transparency remained the influential factor, followed by dialogue, in achieving satisfaction, whereas H2 (PC=0.029,  $p>0.05$ ) and H3 (PC=0.004,  $p>0.05$ ) were not supported. This reveals that access and risk-assessment were not significant and are not positively related to satisfaction. Moreover, H5 was supported (PC=0.687,  $p<0.01$ ), showing a positive relationship between the variables satisfaction and intention to adopt e-resources (Figs. 1 and 2).

## 6. DISCUSSION AND CONCLUSION

Co-creation has been described as a joint activity of

**Table 6.** Summary of results

Effect	Hypothesis	Original coefficient	Standard bootstrap results			
			Mean value	t-value	p-value (2-sided)	Results
Dialogue → Satisfaction	H1	0.3319	0.3204	3.3441	0.0008	Supported
Access → Satisfaction	H2	0.0285	0.0313	0.4282	0.6685	Not supported
Risk-assessment → Satisfaction	H3	0.0036	-0.0002	0.0574	0.9542	Not supported
Transparency → Satisfaction	H4	0.4236	0.4218	4.8546	0.0000	Supported
Satisfaction → Intention to adopt	H5	0.6874	0.6663	6.6544	0.0000	Supported

**Fig. 1.** Conceptual framework.

the consumer and the organization which is performed for the purpose of adding value to the product or service. It has been reported that the level of brand satisfaction of users is high if they are involved in the co-creation process (Oklevik et al., 2022). Although value co-creation is being identified as an emerging area for research in marketing, service, innovation, and new product development related research, however, as per our knowledge, none of the referred studies have examined the role of value co-creation elements in generating satisfaction and intention to adopt e-resources in the academic community.

To overcome this limitation, the present study inspects the influence of value co-creation on satisfaction and intention to adopt e-resources. For this purpose, the DART model of value co-creation has been adopted. Four variables of the DART model, “dialogue, access, risk-assessment, and transparency” have been employed as

independent variables for the study. On the other hand, satisfaction and intention to adopt e-resources played the role of dependent variable. For the purpose of collecting data, Ph.D. scholars and faculty members were selected to report their views on a structured questionnaire, using a 5-point Likert scale.

The conceptual framework was analyzed through structural equation modeling, on Adanco 2.2 software. The reliability of the scale was tested using construct and indicator reliability, whereas convergent and discriminant validity have been used to check the validity of the scale. The results of the study confirmed the reliability and validity of the scales for further investigation. Further, the fitness of the model was tested with the help of SRMR,  $d_{ULS}$ , and  $d_G$  values, which have been found under the threshold limits, representing a perfectly fit model for analysis. Moreover, the path analysis section of structural

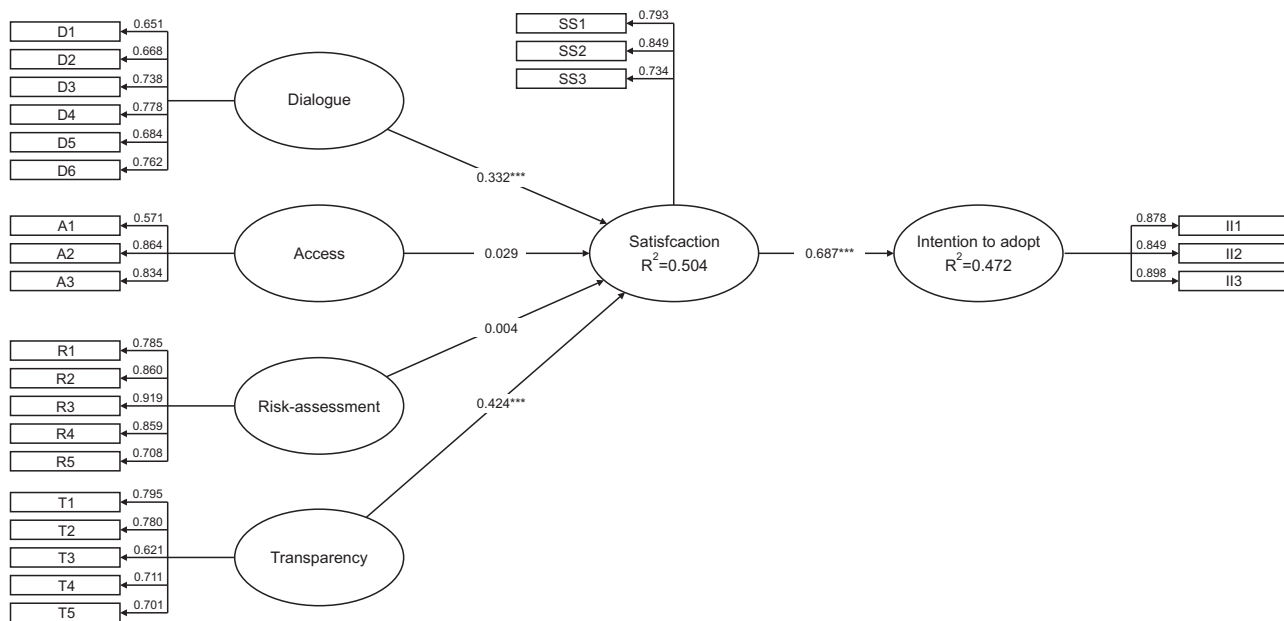


Fig. 2. Structural model. \*\*\* $p < 0.01$ .

equation modelling reveals that two out of four values positively influence satisfaction among the respondents. The values having significant impact on satisfaction were dialogue and transparency, whereas the impact of access and risk-assessment has been found insignificant in the study.

A possible reason behind the insignificant role of access on satisfaction may be the unavailability of the required information to users beforehand, which not only hampers the process of co-creation but also affects the trust between company and customers. Another aspect of finding access as an insignificant component of co-creation may be the reluctance of companies in exposing price-related information to its customers, probably because of the revenue component associated with it. Although companies want their customers to participate in accomplishing the goal of developing an innovative product, these companies do not want their customers to participate in setting the prices, which in turn will be charged from them. Moreover, it is evident from the reviewed literature that a well-informed customer can actively participate in and help the company with co-creating an innovative and competitive product or service with all respects. One of the previous studies has also cited the similar results of the insignificant role of access in co-creation in the case of the telecommunications industry (Taghizadeh et al., 2016). Furthermore, fear of loss could be the possible reason behind the insignificance of risk-assessment in the present

study. Companies could be under the impression that they will fail if they disclose the potential risk associated with the product/service to its customer.

The respondents further stated that they play a minimal role in co-creation, specifically the in case of e-resources, as most of the content is presented to them as per the perception of the company, not as per the requirement of customers. Very few platforms provide a section for feedback on their portals, showing little or no intention to improve their products or services. As a result, customers cannot act as co-creators in developing a good featured product or service. Rather, these customers remained unexposed to all the relevant information and risk connected with the offering of the company. Furthermore, this study elaborated and confirmed the impact of users' satisfaction on their intentions to adopt e-resources with the help of significant results. Following such results, this study is proved to be a unique piece of work, associating value co-creation, satisfaction, and intentions of users to adopt e-resources into one frame. The collected responses have confirmed the association among all three variables and validated the proposed framework of the study.

## 7. IMPLICATIONS OF THE STUDY

With respect to previous research, the present investigation provides very important contributions for academicians, librarians, and e-resource providers. Value

co-creation is a unique concept, being adopted by many industries for encouraging its customers/users to participate in the process of development of a new product or service. The DART model of value co-creation focuses on the same phenomena by highlighting the role of “dialogue, access, risk-assessment, and transparency” in co-creating values. It has been evident from available literature that all of these variables have been employed in many areas of research such as social media, education, government e-services, savings groups, travel services, and online retailing. However, e-resources is one of the unique areas which has been identified as untouched. Companies working on development of e-resources are still not getting benefits from the concept of co-creation. The present study intended to fulfil this gap and investigated the notion of value co-creation in the area of e-resources. Findings of the study will contribute to the existing school of knowledge and help e-resource providers in developing these resources by employing co-creation for the sake of comprehending the viewpoint and requirements of the users.

## 8. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

The current investigation carries some limitation, which creates opportunities for further exploration. To mention a few, the data has been gathered from India only, so it will be difficult to generalize results. Thus, future researchers may collect data from other countries and geographies to generalize the results. Moreover, future studies might qualitatively explore the reasons for the insignificant impact of access and risk-assessment. Future researchers may also target managers of e-resource companies to explore the motives of low customer involvement in co-creation of e-resources. The present study has taken all kinds of e-resources in consideration, so future studies may adopt a case-based research methodology by choosing specific kinds of e-resources for their study.

## CONFLICTS OF INTEREST

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

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# Constructing a Conceptual Electronic Record Management System Model Based on *Eight Indonesian Education Standards* to Support School Accountability

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## ABSTRACT

Record management, especially in schools as an institution's information centre, needs serious attention from government agencies. Under record management policy, there needs to be practical guidance on record management specific to schools. This paper aims to construct a record management model based on the *Eight Indonesian Education Standards* to support school accountability in Indonesia. The urgency of this paper in filling the gap in the Electronic Record Management System (ERMS) role is primarily to support school accountability. It is important to include educational laws and regulations in Indonesia to be a foundation in archive management, including preparing the ERMS. This study aims to develop a model of record management in schools. The final stage in this research is to find the final model. The final model is a model that experts and practitioners have validated. A total of 30 records managers were selected for the interviews. Furthermore, the trial was carried out in 30 senior high schools. The research sampling consisted of representatives of archive managers at selected schools from five islands in Indonesia (Kalimantan, Java, Papua, Sumatra, and Sulawesi). Our research findings show that conceptual models meet valid criteria and significantly impact archivist performance in better schools. The practical implication is that the archival management model based on national education standards policies contributes to practical archives and records management to support school accountability.

**Keywords:** school accountability, digital record, Electronic Record Management System, *Eight Indonesian Education Standards*

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## 1. INTRODUCTION

Accountability, legitimacy, and trust in an institution are exciting topics that should be studied further. The ease of information flow is both a gift and a curse in a large-scale system. All the benefits and opportunities brought by the information revolution will align with the challenges that arise when information is misused. This is one of the consequences that should be considered to maintain the confidentiality of the information itself. However, transparency and openness of information have become unmistakable signs of accountability. The need for information by the public requires institutions to provide transparent data and facts to increase public trust.

Accountability has become a key determinant of policy by education managers. Adequate standards of transparency and good administrative governance will undoubtedly encourage accountability, yet most policies have been selected based on archival evidence in the past. When information has been used, it should be possible to determine what happened and its improper use. There is no denying that the rapid pace of research and technology has driven today's society so that each country's economic and social well-being depends on its ability to employ its human resources; nevertheless, the growth of science and technology is also determined by a sound education system (Chisita & Tsabedze, 2021).

Accountability has even become part of the accreditation assessment set by accrediting agencies. It is understood that an accountable institution can then provide evidence of the performance that has been carried out in the assessment period. Macheridis and Paulsson (2021) argue that accountability emerges as a reinforced requirement, especially in two areas of education, first on a quality assurance system inspired by the new public management, particularly evaluation, and accreditation; second on performance measurement, including financial evaluation and appraisal. Carey (2007) argues that the way accountability is managed, for example, external accreditation as a source of accountability can be very close to self-accountability because it is a process of learning and reviewing from internal and external. Accountability involves the fundamental assumption that the quality of accreditation assurance provides room for accreditation bodies to impose their standards and agendas, encouraging the improvement of the quality of education at certain ranks. It should be underlined that applying accountability and accreditation will provide more excellent value and better innovation capabilities to meet global challenges

(Hoffman, 2013). Therefore, accountability will always be closely attached to educational institutions' accreditation, because the accreditation assessment process will require various information and evidence to measure the availability of information (accountability) assessed by accrediting agencies. Cochran-Smith (2021) states that accountability has been considered a powerful policy tool for improving education, including accreditation requirements.

Based on the National Accreditation Board of Schools/Madrasahs, 1,239 private senior high schools and Madrasah Aliyah based on the five largest islands in Indonesia, showed that 559 private senior high schools and Madrasah Aliyah levels were accredited B. It shows that school managers need more ability to provide accreditation documents as an instrument used in accreditation assessment. In this context, one measure of school accreditation is school accountability. School accountability still needs to improve because one measure of the accreditation assessment is the completeness of the school's documents. This is because the direct support for school accountability assessments can be seen from the completeness of the documents during the accreditation assessment.

Various organizations, particularly educational institutions, face the challenge of incorporating technology into administrative or administrative tasks. Even new technologies have driven mass digitization to improve access to records management (Procter, 2017). Currently, digital archives are overgrowing, and their emergence has become the demand of the times (Rahman, 2020). School accountability, in this case, can be interpreted as an effort to account for all school activities to internal and external parties (Rosjidi, 2001). Following these efforts, schools should prove that they have stored a collection of documents owned as knowledge assets and can be accounted for through a designated archive management infrastructure (Cheng, 2018).

According to Mojapelo (2022), archives produced and received by institutions should be well managed to ensure accountability and transparency for good governance and effective planning. Ibara (2010) affirms that without archives, there would be no accountability, because it is almost impossible to account for the different activities that have been carried out. In this case, the management of school archives should be genuinely accountable to the community, meet legal and policy requirements, and be used for school development (Cheng, 2018). Schools are responsible for community members; therefore, archives as current, authentic, and objective evidence are essential

in guiding school administrations and other stakeholders in good planning and decision-making.

Schools need an archives management to make the institutions transparent and accountable. Schools as a public service require good and effective administration and leadership to carry out their duties, as evidenced by the existence of archives. The management and storage of archives could be more effective. The school will lose its transparency function because it does not have valid evidence of the various materials produced. Managing school documents is tantamount to protecting the interests of school leaders, teachers, students, parents, and other stakeholders (Malone, 2017).

In essence, archive management is essential for various reasons. According to Cheng (2018), an organization generates information, leading to more archives in paper and electronic form. Therefore, organizations should manage these archives well to be accounted for by the public and grow sustainably. Due to technological advances, organizations can now develop online databases that handle large volumes of data. According to Muchaonyerwa and Khayundi (2014), an electronic archival system controlled by providing adequate infrastructure is needed.

Another issue emphasized in electronic archives is that monitoring the level of readiness is an essential step in reducing implementation failures and user rejection of electronic archives (Nusantara et al., 2018). In addition, if the established policies and infrastructure are supported by skilled and experienced archival personnel and excellent and structured training, the management of traditional archives and electronic archives in the company will succeed (Eze Asogwa, 2013). Furthermore, it is essential to evaluate and pay attention to the various crucial and fundamental challenges related to the security of archives (Xiao et al., 2021).

However, archive management at the education unit level, such as in schools, has received less attention, including archive management and the development of standardized information systems to help manage school archives. Research by Oktarina et al. (2019) found that archival administration in schools still relies on a manual system for archiving archives. Manual archiving techniques cannot accommodate speed and precision when archiving is needed. Netshakhuma (2021) states that most educational institutions using manual file systems will only provide access to archive management.

In this research believed that accountability is one of the problems faced by almost all educational institutions, including schools, which consequently impacts school

accreditation (Hoffman, 2013). The main problem is that schools should provide the documents accrediting agencies need at the assessment time. Hasyim and Wijaya (2019) argue that the main problem in the accreditation process for educational institutions is the weak supporting capacity of the required documents; for example, documents are not available or it takes a long time to find the documents, or the documents submitted do not match the criteria; other problems are document management being carried out centrally, making it difficult to find documents when needed. The problem in preparing for accreditation is that supporting data and information required to complete accreditation forms must be well documented (Dwi Ardiada et al., 2022), so good document management is needed to facilitate the preparation of forms and the preparation of accreditation-supporting documents (Hasyim & Wijaya, 2019).

Another problem that often occurs is the lack of awareness of documenting reports by educational actors. Management of accreditation documentation filing is essential because eighty percent of organizational failures are caused by a need for better administrative management support (Widiantoro & Yodi, 2020). The high incidence of conveying the availability of information originating from poor records at schools during accreditation assessments by accrediting agencies is a crucial factor in the emphasis on implementing an Electronic Record Management System (ERMS). Most archivists in schools manage records manually. Technological developments such as ERMS have exceeded the professional capabilities of archive management and archivists. The digital era demands the role of archivists and record managers related to record management to switch to ERMS (Netshakhuma, 2019). Indonesia has its standards (typical) in the implementation of education according to the National Standards of Education policy in Indonesia. However, only a few researchers or practitioners realize that this standard can be adopted in the record management model, which is then promoted as an ERMS. If record managers follow the change process correctly, they may accept new initiatives to improve recordkeeping practices (Shonhe & Grand, 2020). Therefore, this study departs from a considerable research effort by offering a change in record management in the education sector. Our alternative is to design a system oriented towards information accountability and proper use, rather than information security and access restrictions, which we call the ERMS based on *Eight Indonesian Education Standards* to support school accountability. This research aims to develop an ERMS model based on the National

Standards of Education in Indonesia and its implementation in supporting school accountability. In addition, the research results are intended to recommend change management strategies that can be adopted when implementing ERMS under the National Standards of Education in Indonesia.

## 2. LITERATURE REVIEW

### 2.1. Accountability

Accountability is the ability to provide evidence to higher authorities for actions involving the broader community in an organization (Rasul, 2003). According to Turner and Hulme (1997), responsibility is defined as follows:

Accountability is a complex notion that is more difficult to implement than corruption eradication. Responsibility is required for public sector entities to prioritize horizontal (social) accountability over vertical accountability (higher authority).

Accountability is the ability of public sector organizations to respond to parties with interest in the organization (Wicaksono, 2015). Accountability is a type of responsibility from an entity to the obligations obtained, particularly in managing the finances of an entity or organization. It is commonly employed by users of the entity's financial information originating from sources other than the entity (Sari et al., 2018). Accountability is also a measure of the success of a specific entity's or organization's aims and objectives. According to Dee and Dizon-Ross (2019), the potential impact of the public accountability system stems not only from external pressure but also from the support and intervention provided to districts and schools. Proper archives management is critical for achieving efficiency, transparency, accountability, and school service improvement (Mojapelo, 2022). According to Aman et al. (2013), the dimensions of accountability include transparency, responsibility, control, responsibility, and responsiveness. Meanwhile, Rasul (2003) proposes five dimensions of accountability: (1) legal and honest (probability and legality accountability), (2) managerial, (3) program, (4) policy, and (5) financial.

The existence of archives management allows principals and other stakeholders to plan effectively by having information to direct planning efforts to decision-making. With archives, sound planning is merely wishful thinking; and it will be impossible to attain, because archives are re-

quired to make policy decisions.

### 2.2. Indonesian National Education Standards

Indonesia has a minimum standard of criteria regarding the education system that applies throughout the country. These criteria are answered in Law No. 20 of 2003 concerning the National Education System. The function of this standard is a basis for management in the process of achieving quality education. Meanwhile, the goal is to ensure national education quality within the context of teaching the nation's life and creating the character and civilization of a dignified nation.

Furthermore, the elaboration of the eight national education standards is: (1) content standards are material components and levels of competence to achieve graduate competence at certain levels and types of education; (2) process standards related to the implementation of learning in each academic unit; (3) Graduate Competency Standards are criteria or qualifications concerning the ability of graduates, which are divided into attitudes, knowledge, and skills; (4) standards of education and education personnel are educational criteria for eligibility for education in positions; (5) the standard of facilities and infrastructure includes the minimum criteria for facilities and media that support learning; (6) management requirements include effectively and efficiently planning, implementing, and overseeing educational activities at education units, districts/cities, provinces, and national management; (7) financing standards specify the components and quantity of operating expenditures for educational units that are effective for one year; and (8) assessment standards are linked to various systems, procedures, and assessment instruments to establish student learning outcomes.

### 2.3. Electronic Archives

Regulation No. 6 of 2021 of the National Archives of the Republic of Indonesia Concerning the Management of Electronic Archives, clause 1, paragraph 2 defines electronic archives as archives created, specifically archives created and received in electronic format or archives resulting from media transmission. According to Sugiarto and Wahyono (2015), digital archives are essentially the same as traditional ones. There are, however, distinctions in the cabinet's shape, particularly between a virtual cabinet and a virtual map. Furthermore, according to Duranti (2010), the fundamental difference between electronic and traditional archives is that electronic archive components can be in many areas of media or even systems, and may

only exist physically if purposely constructed. This indicates that a complete archive is one whose components are inextricably and immutably associated with one another and have been made explicit by translating them into a form element, such as specifying archive bindings in a categorization code. According to Priansa and Garnida (2013), digital archives are a combination and preparation of archives using technology, specifically manual archives turned into digital data via a scanner procedure.

Digital archives include three components: virtual cabinets, virtual folders, and archive sheets in the form of files (Sugiarto & Wahyono, 2015). A virtual cabinet is a database that resembles the shape of an authentic cabinet used in conventional filing systems. The difference is that the ability to accommodate data in a physical cabinet is limited, whereas a virtual cabinet is not; the limit is the physical capacity of the hard drive to store digital data. A virtual folder is a database with the same attributes as a physical folder in a traditional archiving system. However, unlike traditional folders with restricted document storage capacities, a virtual folder has unlimited storage possibilities. Archive sheets in virtual folders can be either document files or graphics. Document files are files made by Microsoft Word, Excel, and PowerPoint, among other programs, while an image file is a file in the form of an image as a result of a scanner or bitmap import from other media.

### 3. METHOD

This study uses a research and development approach. The stages used by Borg and Gall (1983) include information and data collection, planning, draft product development, initial field trials, revision of initial field trial results, field trials, product improvement field trials, field implementation trials, final product improvement, and dissemination and implementation. The ten stages are grouped into three parts. The first part is information gathering and needs analysis. The second part is product development in the form of an ERMS model based on the *Eight Indonesian Education Standards*. Finally, the outcome of the ERMS model is based on the *Eight Indonesian Education Standards*.

#### 3.1. Participants

Following a qualitative approach, we interviewed at least 30 managers selected from five islands in Indonesia (Kalimantan, Java, Papua, Sumatra, and Sulawesi). The demographic characteristics of the 30 participants are pro-

**Table 1.** Demographic characteristics of participants

Demographics	Amount (n=30)
Age groups (yr)	
18-27	10
28-37	17
38-47	3
>47	0
Employment status	
Civil servant	5
Honorary employee	25
Education level	
Diploma	2
High school graduate	25
Bachelor's degree	3

vided in Table 1.

This study's subjects or key informants were human data sources (key informants). Informants were determined as data sources using purposive sampling techniques or with specific considerations, school accreditation status, knowledge of archives, and involvement in school archive management.

#### 3.2. Data Collection and Analysis

Data were collected by two techniques; interviews and open questionnaires. Research data was obtained by using interviews and open questionnaires. We interviewed 30 school records managers and then collected information using questionnaires. Our research presents some interview results that represent informative answers considering relatively the same answers. Furthermore, we distributed questionnaires to facilitate the process of collecting complementary data through a needs analysis from the presence of ERMS. Data analysis was carried out using the analytical model initiated by Miles and Huberman (1984) through three stages: data reduction stage, data display, and conclusion or verification. The data in this study have also gone through a triangulation process to increase the credibility and validity of research findings. Triangulation is intended to reduce, eliminate, or compensate for the lack of a single strategy, thereby increasing the ability to interpret findings (Thurmond, 2001).

## 4. RESULTS AND DISCUSSION

### 4.1. Preliminary Studies Stage

This stage describes various phenomena relevant to managing records in schools already running. We conducted open interviews with some of the informants we selected. We used interview guidelines based on phenomena that occur in the field. The data from the interviews is presented as follows.

We asked about the implementation of record management in schools. One informant stated:

“...so far, we are still using manual storage. We store all school documents using the owner by providing the subject of our archives. We arrange each owner neatly in a wooden cupboard. When we need archives, we have to look for these owners. We need more funds to adopt technology in records management at our school. We only have one officer, who concurrently has other duties because there is no special officer...”

The second informant stated:

“...in our school, there is no special filing officer. Archive storage at our school is still done manually. We have several filing cabinets to store archives—usually, we borrow archives manually by looking for a one-by-one defiling cabinet. We have not found the right system to store archives digitally. Besides, we need training to manage archives digitally because this is something new for us...”

The third informant stated:

“...we still manage the various archives manually. Because so far, we have yet to get the right software or application to manage school records. Managing archives manually requires much space; moreover, the procedural retention of archives means we have not destroyed some. We know that digital archives make school administration activities easier, but we have not been able to provide software or application facilities that suit our needs...”

The fourth informant stated:

“...most of the archives at our school are stored manually, and some are stored on a laptop on local disk C. We have not used electronic or digital archives because there has been no training effort. Even though nowadays it is important to back up archival data digitally so that it is easy to distribute when needed by various

parties...”

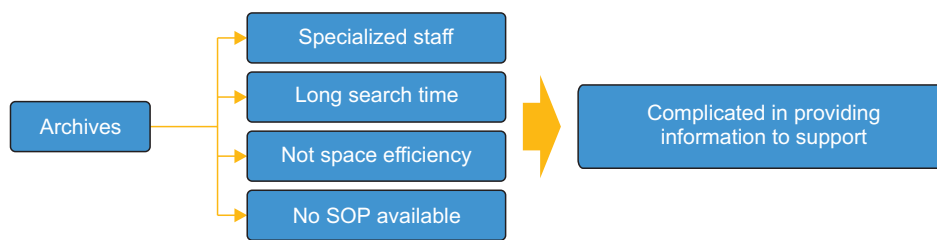
The fifth informant stated:

“...actually, we want to use archives electronically or digitally. However, various providers have offered software or applications that do not suit our needs. Our example requires the storage of archives relating to the administration of the education sector, such as curriculum archives, performance archives, evaluation results archives, and others. Usually, applications or software are offered to use incoming and outgoing files that are more appropriate for companies. We have not found the right archive app for our school...”

Based on the results of interviews, the factual model of records management in schools so far is shown in Fig. 1. The factual model generally functions to represent the phenomenon being studied. The factual model clarifies how the actual situation is in the field. Furthermore, the factual model provides a solid basis for further exploration and analysis regarding the development of a model. We compiled a factual model based on the results of interviews with informants in order to provide a framework that allows a better understanding of how record management has been carried out so far (Fig. 1).

Disclosures based on interviews conducted with the five informants show that they carry out record management traditionally and are guided by traditions from the previous system. Of course, this is ineffective because the more archives, the more difficult it is to achieve retrieval. For archive management that has been carried out, overall archive administration is adequate, but archive recovery still requires a long time. The maximum archive recovery time is usually one minute. In addition, the archive management of 30 high schools in the five largest islands in Indonesia is based on something other than archive management, according to Law no. 43 of 2009. No special officer handles school archives, and the schools still need a standard operating procedure (SOP) for record management. In addition, the management system is still manual. Administrative officers oversee school records in addition to other administrative responsibilities.

Elements of parties related to managing school records indicate that the parties involved in managing school records still need to have a solid commitment to managing school records. The well-applied SOP is expected to eliminate the problem of lost archives. Many internal and external school parties borrowed archives but did not comply with the procedures. They were borrowing



**Fig. 1.** Factual model of school record management so far. SOP, standard operating procedure.

**Table 2.** Participant response needs analysis

No.	Question	Mean (n=30)	Description
1	Do you need an application (ERM) to help with your filing work at school?	3.0	Very needed
2	If you need an application (ERM), do you need the classification of the documents you are working on according to Indonesian educational standards?	3.47	Very needed
3	Your primary need is an application (ERM) with classification according to national education standards.	3.73	Very needed
Average		3.60	Very needed

ERM, Electronic Record Management.

archives without following the SOP, making archives unknown and uncontrollable. Furthermore, based on the views of administrative officials who handle archives, this differs from the established archive storage system. The archive factor in supporting school accountability shows that the current management of school records needs to be revised. There is no agreed archive storage mechanism, and no SOP has been made. In addition, the parties committed to implementing school management still need to be improved.

To get more information on the information system needs analysis, we distributed questionnaires. Based on the questionnaire we distributed, we found that the mean value of the three questions we asked indicated the level of need is “very needed.” This means that record managers in schools need an ERMS based on the characteristics of work in the field of education (Table 2).

#### 4.2. Model Design Development Stage

The development of this system is designed to answer the phenomenon of various problems and the current weaknesses in managing school records. Inadequate management of school records results in reduced documentation support to support school accountability. When a physical archive is urgently needed and cannot be found in less than a minute, it is possible that the archive is lost. Consequently, administrators lack a model records management system to support school reports, information, and accreditation documentation. In Indonesia, the digital archive system model is based on the Eight National

Education Standards, including considerations related to school accountability to internal or external school parties, accreditation, and reporting. Thus, the storage system is *Eight Indonesian Education Standards* based on the problem or subject system (*Subjectical Filing System*). The *Subjectical Filing System* is commonly applied in Indonesia where documents are grouped into an index list to determine the existed subjects. We use the existing eight educational standards as the main Subjectical classification in the filing system, and then documents can be stored following the main Subjectical given. As for the main Subjectical in the ERMS that we have compiled, we describe it in the Table 3.

In the next step, we developed a model designed to address the various difficulties faced by school staff. We conducted focus group discussions to get assessments and responses from staff at the school. Some of the input they provide is in the form of the following:

Expert informant 1 stated that:

“The preparation of an electronic records management model should adapt to the context and characteristics of the archives produced by the educational institutions to include them in the guidebook when developing a system. This is necessary so that users are clear when classifying archives.”

Expert informant 2 stated that:

“The purpose of developing the model is to overcome problems in the field and create an impact or contri-

**Table 3.** Types of archives stored based on *Subjectical Filing System*

No.	<i>Subjectical Filing System</i>	Example archives stored
1	Standard of management	Documents for determining the school's vision and mission, the medium-term work plan, the annual work plan, school activities, budget plans, school revenue and expenditure budget plans, student administration documents, student statistical data, etc.
2	Standard of content	Curriculum documents, curriculum development documents (including local content curriculum), curriculum development decrees, collections of references/references/regulations, etc.
3	Standard of process	Teacher administration (syllabi, annual programs, semester programs, details of effective week/day, learning implementation plans, teaching schedules, assessment documents, attitude assessment sheets, remedial and enrichment programs and implementation, assessment analyses, absorption, teacher agendas, etc.)
4	Standard of graduate competency	Student assignments, student achievements, national examinations, school standing orders, etc.
5	Standard of teacher and staff	Files of educators and education personnel, employee handbooks, collections of decision letters on the division of tasks and job descriptions, teacher and staff presence and their recapitulation, minutes of meetings, programs and reports on the implementation of library management, programs and information on the performance of laboratory management, teacher and staff participation documents in a scientific forum
6	Standard of educational assessment	Assessment planning, assessment implementation, evaluation, etc.
7	Standard of facilities	Legality, reports, textbooks and etc.
8	Standard of financing	Facilities and infrastructure investment, finance, guidelines for financial management, etc.

bution from the results of implementing the intended model so that various parties can easily understand it.”

Expert informant 3 stated that:

“There are many archives in the field of education. It is necessary to clarify the specifics of the model developed regarding archives that can be stored following the standards developed.”

Practitioner informant 1 stated that:

“We need an archive storage container that is under the educational context. We have archives of various educational activities and sections. We hope that contextually the difference between the model developed and what we have been doing so far will show a significant difference.”

Practitioner informant 2 stated that:

“The administration that we do is very complex. The preparation of the model should also adapt to the complexity of administrative activities that are generally carried out at school.”

Next, we evaluate and refine the model from the input provided by experts and practitioners. We strive to pro-

mote the *Eight Indonesian Education Standards* as the strength of our model. Records are created and generated following the activities and events of the institution so that we consider the various records produced by the school. Then we adopt and classify them according to the *Eight Indonesian Education Standards*. The final model that we compiled is as follows:

Archives received or produced by the school will initially undergo a media transfer or scanning process. Furthermore, the archives are included in a database in which eight standard classifications follow national education standards. The main problem in the field is that there needs to be a firm commitment to switch to digital-based record management for various reasons. We provide alternative models and application descriptions that we simplify according to the needs of the staff at the school. Fig. 2 illustrates the ERMS model we compiled. Various letters will be stored in one database.

Furthermore, if users need an archive, they only need to enter a “keyword” or “Achieved Code” that in less than <1 minute will be found. The ERMS model is one of the solutions to provide complete data backup and discovery in a short time. Authentic archives are scanned using scanning technology and stored in an electronically based

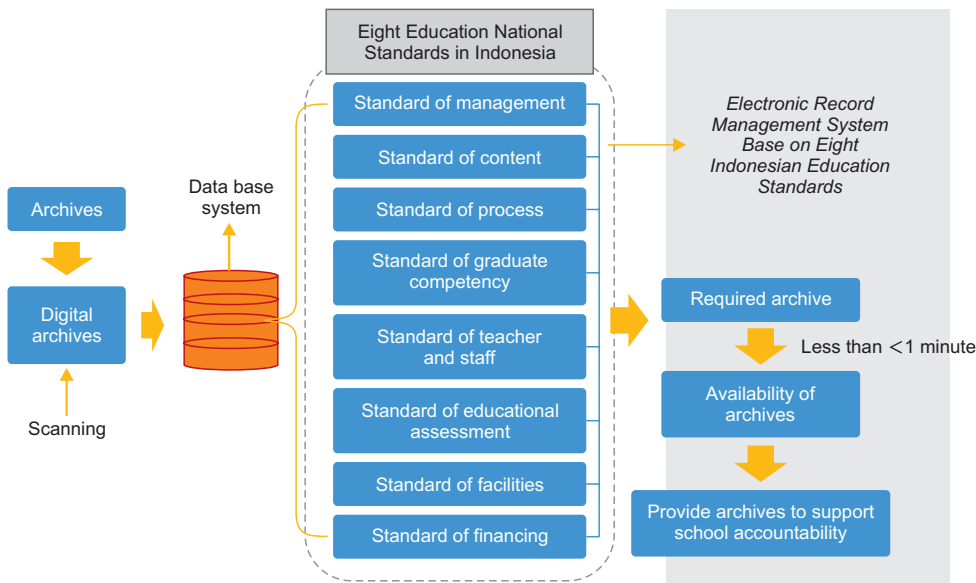


Fig. 2. Final model Electronic Record Management System based on *Eight Indonesian Education Standards*.

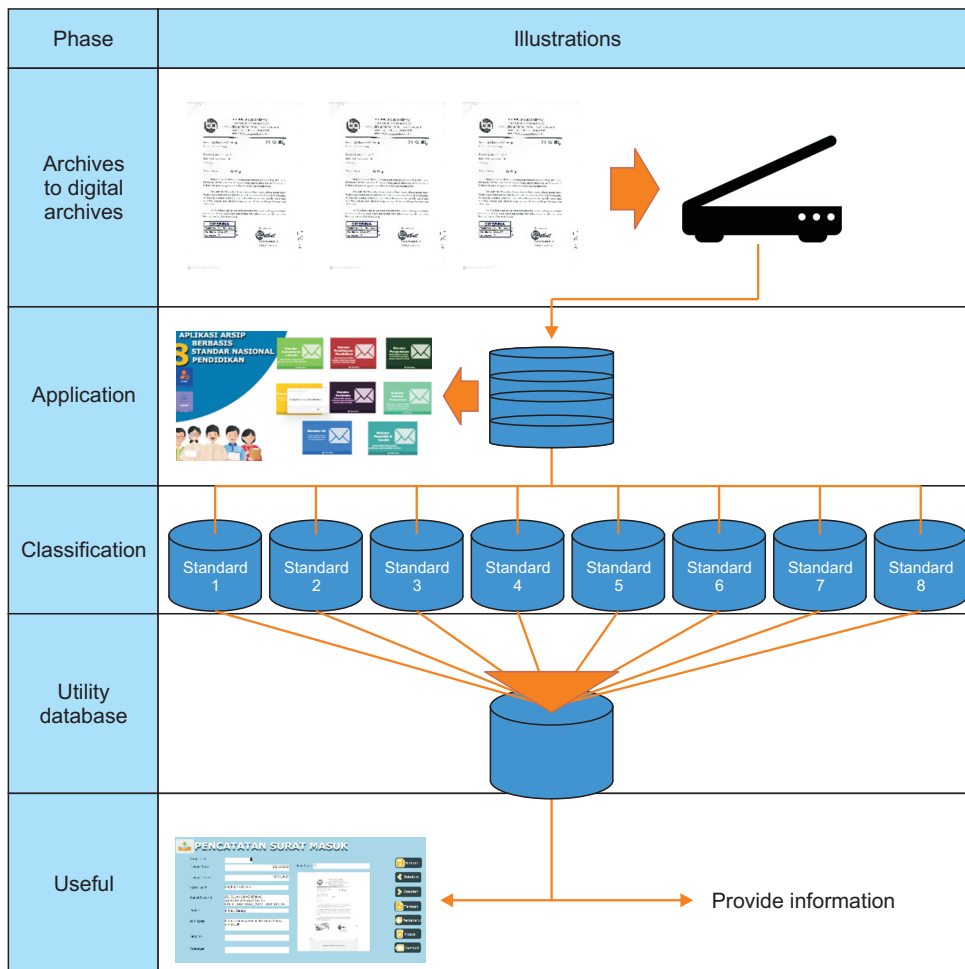


Fig. 3. Illustration record management system model based on *Eight Indonesian Education Standards*.

system. To overcome the problem of the weak supporting capacity of school accountability documents, a digital filing system model was developed based on Eight National Education Standards. Next, we describe the ERMS software we are developing, as shown in Fig. 3.

The development of a digital archive system model based on *Eight Indonesian Education Standards* is an extension of the Indonesian National Education Standards, which include eight standards: (1) content standards, (2) process standards, (3) graduate competency standards, (4) academic staff standards, (5) facilities and infrastructure standards, (6) management standards, (7) financial standards, and (8) educational assessment standards. The availability of information in a database will facilitate record management in schools. All forms of information can be stored according to a predefined classification.

This research aims to develop an ERMS model based on the National Standards of Education in Indonesia and its implementation in supporting school accountability. Accountability goes hand in hand with the availability of information external parties need. Based on the model we developed, we agree that archives are a center of information to be the key of evidence that can be used as a measuring tool in accountability. Excellent and proper records management will undoubtedly affect how information is provided as a measure of accountability. For example, in assessing school accreditation, one always needs complete information on various activities and aspects of school assessment. Accreditation is carried out within a certain period, while records always accumulate at any time. Therefore, the school's ability to carry out proper record management is critical in supporting school accountability.

Accountability is a component of good governance. Kumah and Brazys (2016) mentioned that there is a link between the legislation reviewed and accountability. Access to information is vital for good governance. Access to information is also a key variable for achieving reasonable governance goals (Netshakhuma, 2019). Freedom of access to information is recognized as a fundamental aspect of the objectives of accountability, transparency, and openness (Thurston, 2015). This is because records provide evidence to support the investigative phase of the accountability process. With reliable recording activities, accountability can be proven (Netshakhuma, 2019).

Archives are the most important source of knowledge and experience for any institution. Good records management will provide institutional accountability and access to timely information in the context of developing coun-

tries, but obstacles in the field of improper records management are the main obstacles (Ain, 2019). Currently, many public services, including schools, must switch to electronic systems to be more efficient in producing documents, with the number continually increasing from time to time. The traditional method requires a large amount of space or inefficient places, and there is a high probability that the archive will be lost. However, apart from the benefits of technological advances, most organizations need to pay more attention to records management (Dikopoulou & Mihiotis, 2012). Records management must still be prioritized in developing countries (Asogwa, 2012). The design of ERM is urgently needed to help work units find documents quickly where it takes little time to periodically search and store them (Astari et al., 2020). Since records are the product of action, it is crucial to provide an information system model based on function so that actionable records remain intact and reliable and that records are reliable (Mukred & Yusof, 2015).

Many studies have focused on examining how ERMS can improve school performance, such as Mukred et al. (2019) in their finding that organizations are determinants of intention to adopt ERMS. Their findings also explain that the dimensions of top management support, financial management, training, and policy are essential to realizing this intention. Ismael and Okumus (2017) claim that implementing electronic document management can improve document discovery more quickly and efficiently. However, there still needs to be more studies on preparing the ERMS based on the inherent characteristics of the organization, such as the Educational Standards in Indonesia that we studied. Therefore, paying attention to the ERMS according to specific characteristics is essential. The characteristics in question are compatible with various stored documents that must be adjusted to the device used.

The alternative we produced from this research is a system design oriented towards information accountability and proper use, rather than information security

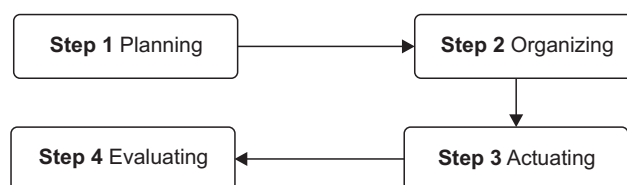


Fig. 4. Electronic Record Management System change management strategy.

and access restrictions, which we call the ERMS based on *Eight Indonesian Education Standards* to support school accountability. The study's results recommend a change management strategy that can be adopted when implementing the ERMS following the Indonesian National Education Standards. The change management strategy systematically adjusts ERMS tools in school archival activities to support accountability. Without an appropriate management strategy, ERMS can contain inauthentic and unreliable information that lacks integrity, so it cannot be used (Mukred & Yusof, 2017). Our change strategy is structured in four steps which we present in Fig. 4.

*Planning* is an activity related to a series of rational sequences in preparing plans with decision-making for using ERMS in the long term and short term. In this case, planning always starts with determining a strategy, such as a needs analysis and a clear framework for achieving goals. Next, the preparation of policies by the school principal. The method is in the form of preparing SOP. Finally, the costs must be ready to achieve the goal.

*Organizing* determines activities and responsibilities to the people or staff experts needed to achieve goals. In this study, ERMS responsibilities must be clearly described because the task relates to the legal basis and job descriptions in carrying out work. Establishing authority and responsibility will make it easier to identify when problems occur in archiving activities.

*Actuating* is an ERMS implementation activity and archival work to achieve the goals that have been set. For the goals to be achieved, it requires the commitment and compliance of the staff involved so that they can work according to work guidelines.

*Evaluation* is a process that critically examines the use of ERMS. This stage involves gathering and analyzing information about the ERMS's benefits, characteristics, and performance results of records management.

Undeniably, the traditional way of record keeping has been radically pushed to switch to ERMS, considered a panacea for records management (Zinner Henriksen & Viborg Andersen, 2008). Advances in technology have brought dramatic changes to records management since the availability of various systems that can be used (Shibambu & Marutha, 2022). Mukred et al. (2022) found that the safety factor was the predictor with the most significant contribution to intention of educational institutions to use ERMS as an alternative to records management. As Ismael and Okumus (2017) state, the general considerations for educational institutions to switch to using ERMS include increasing the effectiveness of actions

taken by reducing task completion time, reducing costs, increasing control, increasing the level of data integration, increasing service quality, increasing internal and external communication of school organizations, and increasing the number of documents appropriately processed. The presence of ERMS will benefit the academic community so that, as much as possible, communities can continually update data on accreditation supporting documents so that there are no difficulties in finding and submitting data during the field assessment process (Hasyim & Wijaya, 2019).

Our alternative is to design a system oriented towards information accountability and proper use, rather than information security and access restrictions, which we call the ERMS based on *Eight Indonesian Education Standards* to support school accountability. The research results recommend a change management strategy that can be adopted when implementing the ERMS following Indonesia's National Standards of Education.

## 5. CONCLUSION

The findings of this research describe the shortcomings of the implementation of record management in schools in providing the information needed to support accountability. Our findings are that there are no exceptional staff who have become archivists at school, there are limited facilities and infrastructure, and commitment from school members to implement electronic-based archives still needs to be higher. We offer an ERMS model based on *Eight Indonesian Education Standards* to support school accountability. We consider various educational standards that we adjust to the needs of the field so that the resulting model can be applied and contributed empirically. However, we acknowledge that further research is needed regarding implementing this model. This research is still limited to model development, not to the implementation or execution of the model. In the future, we will conduct further research on implementing the model we developed in this paper.

## CONFLICTS OF INTEREST

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

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# Research on the Discourse of Libraries During COVID-19 in YouTube Videos Using Topic Modeling and Social Network Analysis

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## ABSTRACT

This study explored issues related to the library in the COVID-19 era in YouTube videos in Korea. This study performed social network analysis and topic modeling analysis by collecting 479 YouTube videos, 20,545 words, and 8,379 channels related to COVID-19 and the library from 2019 to 2020. The study results confirmed that YouTube, a social media platform, was used as an important medium to connect users and physical libraries and provide/promote online library services. In the study, major topics and keywords such as quarantine, vlog, and library identity during the COVID-19 pandemic, library services and functions, and introductions and user guides of libraries were derived. Additionally, it was identified that videos about COVID-19 and the library are being produced by various actors (news and media channels, libraries, government agencies, librarians, and individual users). However, the study also identified that the actor network is fragmented through the channel network, showing a low density or weak linkage, and that the centrality of the library in the actor network is weak.

**Keywords:** COVID-19, library, YouTube, social media, network analysis, topic modeling

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## 1. INTRODUCTION

Since the first confirmed case of COVID-19 in December 2019, the world has been struggling with the COVID-19 pandemic. In South Korea, the first confirmed case was reported in January 2020, and since then the COVID-19 situation has continued, with several rapidly spreading and subsiding periods for more than three years.

The spread of COVID-19 has introduced a contactless environment in all sectors of society. As the situation continues longer than expected, “contactless” is being accepted as a core keyword in the new normal era. Additionally, due to social distancing measures introduced to prevent the spread of COVID-19 infection, participation in events and gatherings of large numbers of people was restricted, and accordingly, the use of cultural institutions such as libraries, art galleries, and museums was greatly reduced.

Concerning libraries, it was inevitable that some services had to be suspended, with opening hours adjusted and closed for a certain period according to the social distancing stage. Namely, libraries had to go through a repeated cycle of closures and re-openings. However, this did not mean libraries ceased their services during closures. They actively introduced new alternatives, such as using the library’s digital content, strengthening existing online services, implementing contactless loan services such as book drive-throughs, and continuing existing library programs using a real-time video platform. Also, in the reopening stage, libraries have maintained their services and have made efforts to change the so-called 4S (Space, Service, Safety, Sanitization) and to adapt to the changes by reconstructing their space to minimize face-to-face contact, and setting safety measures and sanitary rules to protect users from infection and allow them to use the libraries safely (Dobrevă & Anghelescu, 2022). Currently, the possibility of COVID-19 becoming endemic is being raised. It has come to a point where we must focus on the challenges and changes experienced so far and settle into a new form of libraries rather than going back to the pre-COVID-19 outbreak situation.

Therefore, it is necessary to investigate the discourses surrounding the library in the context of a COVID-19 disaster, namely, the library’s disaster response, the services provided by the library, the library usage behavior, and the perception of and demand for the library, and use the results as data that enable the establishment of a direction for the new library. Although these discourses are also dealt with in various media and in studies, they can occur

more freely and in a more diverse way on social media. Social network analysis can identify the influence of library services performed through social media in contactless situations and can provide guidelines on how libraries can use social media in the future.

Based on this background, this study explores the “COVID-19 and the library” issue over the past two years through social network analysis and topic modeling analysis. The analysis was limited to the current situation in South Korea, and data from YouTube among multiple social media were collected and analyzed.

## 2. LITERATURE REVIEW

### 2.1. Types and Characteristics of Social Media

Social media refers to a service platform that connects people who have signed up for a social networking service (SNS). SNS is a service that connects one person to another. There are various types of social media, and although the characteristics of each platform are different, they have in common features such as profile management, content production and sharing, presentation of opinions, and social network management. However, there are differences in user interaction methods and content types. Among them, YouTube is the world’s largest video sharing site, launched in 2005, where users can upload videos they have created, watch them with others, leave comments, and share them. These videos can be shared through other social media channels such as Twitter and Facebook. Recently, YouTube has been positioned as a means of active communication between content creators and users with the activation of information recommendations by algorithms and the activation of comments. Additionally, as the use of YouTube as an information search tool has rapidly increased, the number of monthly users has exceeded 1.5 billion, making it the second-largest search engine in the world after Google (Kong & Ahn, 2020).

### 2.2. Studies on Libraries’ Response to COVID-19

Since the COVID-19 pandemic, most research on libraries has been conducted on their responses to the COVID-19 situation and the information needs of users. Libraries provided information on personal hygiene and electronic information sources (Oméluzor et al., 2022), repaired existing services, or developed and supported new services (e.g., tele-reference service; Avila et al., 2022). Additionally, since users wanted their information usage pattern before COVID-19 to be maintained, they requested information on the latest topics and a diversity of tools

and services that can be accessed through contactless interaction (Harlow, 2022; Wahler et al., 2022). In addition, during this period, social media played an active role as an information communicator in various fields of society, and it was reported that when the library provided the latest information using social media, it was highly useful in resolving users' information needs (Kerns & Robertson, 2022). Additionally, it was confirmed that significant changes were made in digital applications, user support, and librarian education over the COVID-19 period (Barreto et al., 2022).

### 2.3. Social Network Analysis Study of Library Data in COVID-19

Social network analysis studies related to COVID-19 have also been conducted from various perspectives. At the beginning of the epidemic, social network analysis was performed to understand the spread of COVID-19-related information, trust in information, and social perception and frame (Hung et al., 2020; Kim et al., 2022; Yum, 2020). Over time, social network analysis was used to study changes and responses to sustain daily life in the COVID-19 situation, and social media data analysis studies on the library in relation to COVID-19 have appeared in the library field.

Park and Oh (2020) analyzed news reporting patterns and major issue changes using text-mining technology to recognize the library field's activities and changes in the environment surrounding the library in response to the spread of COVID-19. Based on 1,852 news reports and 227,983 library-related tweets, four issues were derived, namely, prolonged contactless situations, increases in e-book loans, improving expectations for online services and librarians, and reexamining library space needs. A follow-up study comprehensively summarized the responses of libraries in South Korea to the spread of COVID-19 and investigated user responses to library-related issues by analyzing 496,741 tweets related to libraries in 2019 and 2020. The analysis results revealed that there were four issues, namely, COVID-19 and lack of face-to-face service, e-books and electronic services, library operation and hosted events, and use of space and materials. It was also confirmed that the aspects mentioned in the tweets varied according to the closure period and partial opening period while libraries went through a period of four temporary closures and three partial openings during 2020 (Park & Oh, 2021).

Alajmi and Albudaiwi (2021) investigated the use of Twitter in public libraries during the first few months af-

ter the outbreak of the COVID-19 pandemic. The study analyzed 9,450 tweets posted by 38 public libraries in New York from December 2019 to April 2020; 85.5% of the tweets posted by the New York Public Library system included information about routine library services (information on remote library services available during the lockdown, social support information, etc.), and 14.5% were COVID-19 information. During the pandemic, most public libraries in New York City continued to operate as usual and supported the community in maintaining a sense of calm during the tense period.

Osakwe and Cortés (2021) analyzed information shared on Twitter in Spanish about the COVID-19 pandemic using a text mining approach. About 10,000 tweets were collected by searching for "Coronavirus," "COVID-19," "Corona," "#COVID19," and "#Coronavirus" from June 3 to June 10, 2020, and were categorized by topic. As a result, six themes were identified: (1) prevention measures, (2) epidemiology/surveillance, (3) economic impact, (4) optimizing the nursing workforce, (5) access to reliable information, and (6) a call for a response from the local government. The top trending hashtags were #COVID19 (n=7,098), #Coronavirus (n=6,394), and #SN-TESALUD (n=2,598).

Therefore, social network analysis studies of the COVID-19 discourse have mainly been conducted using Twitter. Since YouTube is characterized by active reactions and sharing between creators and users, users and users, and other social media platforms, the analysis of library discourse on YouTube is expected to capture meaningful changes in a broader and more multifaceted context than previous studies.

## 3. METHODS

### 3.1. Data Collection and Preprocessing

To perform social network and topic modeling analysis on libraries and COVID-19 on YouTube, data were collected for 24 months from January 2019 to December 2021, when COVID-19 broke out in Korea. Keyword network analysis program NetMiner4.4 (Cyrax Inc., Sungnam, Korea) was used to collect and analyze YouTube data. The keywords "COVID-19," "coronavirus," "library," and "libraries" were used to search for data.

The keywords used in the collected data were organized by word spacing, part of speech, and similar words. Preprocessing was performed where words were difficult to understand. Preprocessing methods were based on studies by Feinerer and Hornik (2014) and Oh and Park

(2018). Punctuation, numbers, symbols, stopwords, and words that were less than three letters long (e.g., !, \*, and, or) were removed. The terms “YouTube,” “video,” “Coronavirus,” and “COVID-19,” which were common in all videos, were excluded, and similar terms were gathered. After applying this process, 479 videos, 20,545 words, and 8,379 channels were collected. The video trend by year is seen in Fig. 1. Related videos continue to increase and decrease, but it can be seen that more YouTube videos were created in 2020 (287), when COVID-19 emerged and library access and face-to-face services were suspended, compared with 2021 (192), when library access and face-to-face services were resumed.

### 3.2. Analysis Method

In this study, first, keyword frequency extraction, centrality, co-occurrence keyword frequency analysis, and network analysis were conducted to analyze the keywords of YouTube videos related to libraries during the time of COVID-19. Second, topic modeling analysis was conducted to understand the topic of YouTube videos related to the library at the time of COVID-19. Third, frequency extraction, centrality, and network analysis were performed

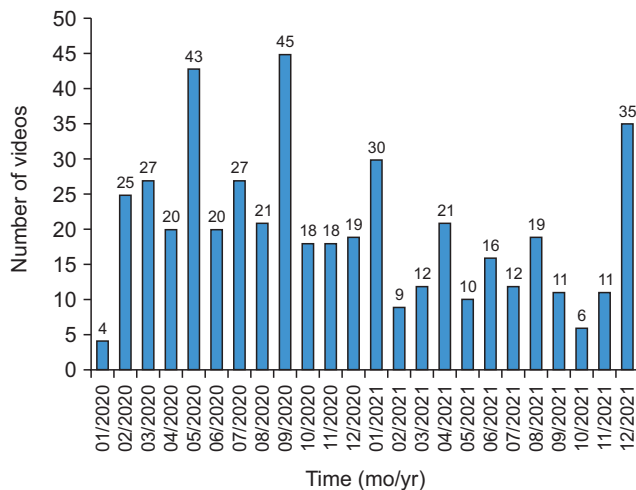


Fig. 1. Video trend by year.

to analyze the user community. The following Table 1 shows data items collected to analyze YouTube videos, terms, and channels.

#### 3.2.1. Social Network Analysis

Social network analysis is a method to quantitatively analyze the topological structure and diffusion process by modeling the relationship between individuals and groups as nodes and links. By analyzing the network consisting of nodes and links to analyze the density, distance, cohesion, connection degree, centrality, etc., it is possible to understand the connection between entities and the knowledge structure for a specific issue (Borgatti et al., 2013).

For social network analysis on YouTube video, keywords, channels, and replier/commenters were extracted, and relational properties between videos were extracted as a link. Additionally, keyword analysis, co-occurrence network analysis, and centrality analysis were performed to investigate the keywords and network between keywords appearing in the video and channels and the channel networks of the video and replier/commenters.

#### 3.2.2. Topic Modeling

Topic modeling analysis is an algorithm that automatically extracts a topic or topic group representing the texts based on the simultaneous use pattern of keywords from massive unstructured data (Blei, 2012). Topic modeling is a statistical model that derives the topic of document groups, and it consists of a probabilistic set of topics. In this study, Latent Dirichlet Allocation (LDA), introduced in 2003 in the seminal paper of Blei et al. (2003), was applied among topic modeling models. The LDA method estimates the distribution of terms and documents through the Bayesian technique, which assumes that there is a prior distribution of terms and documents, and infers main topics constituting the entire text data and keywords constituting the topics.

Topic modeling and social network analysis are being used in various fields to understand research trends and knowledge structures on issues. Zhang et al. (2012) performed social network analysis to analyze research trends

Table 1. Data collection method and content

Video	Video ID, video title, date/time, channel ID, channel name, views, likes, dislikes, comments, description
Words	- Word ID, word, part of speech, frequency - Related channel ID, terms used by the user in videos, comments/replies, total number of times used
Channel	- Channel ID, channel name - Video ID, video title, writing date/time, writer ID, writer name, comment/reply ID, number of comments/replies, whether there are comments/replies, full text

in the field of patient adherence. Their study carried out co-occurrence network analysis and social network analysis on 2,308 articles from 2000 to 2011 in the Web of Science. The study found that the research topic in the early stage reflected the general research content of the study, but in the later period, many new terms appeared and the research field was greatly expanded. Jussila et al. (2017) used social network analysis and topic modeling to analyze social big-data-related researchers and related topics. The study searched 58 articles related to social big data and compared the co-authorship network and citation network and major topics. Recently, topic modeling and social network analysis have also been used to analyze issues related to COVID-19 on social media. Zhang et al. (2021) collected tweets about the three anti-epidemic measures of COVID-19 (mask, vaccine, lockdown) on Twitter from February to October 2020, focusing on four cities in Canada and the US. The collected tweets were analyzed, focusing on human emotional responses. As a result, it was found that public sentiment about COVID-19 differed by time and place, and in general, people have positive feelings about COVID-19 and masks but have negative feelings on topics about vaccines and lockdowns. In other words, topic modeling and social network analysis are being used to identify discourses on various issues in various fields and are used as methods to analyze social media data.

In this study, keyword analysis and topic modeling analysis were conducted together. While keyword analysis is a research method that quantitatively identifies frequently occurring keywords and co-occurring keywords, topic modeling is a method that reversely classifies the topics that appear in a set of documents based on the

probability distribution, so they are complementary.

## 4. FINDINGS

### 4.1. Keyword Analysis

Social network analysis was performed for keyword analysis. Because of the analysis, it was found that 20,545 keywords were used in the 479 videos. The keywords most frequently used in COVID-19 and the library videos were “video” (2,348 times, 153 videos), “use” (461 times, 112 videos), “prevention” (943 times, 94 videos), “online” (333 times, 92 videos), “subscription” (442 times, 86 videos), “books” (209 times, 81 videos), “homepage” (174 times, 76 videos), “channel” (482 times, 75 videos), “progress” (272 times, 75 videos), “society” (596 times, 74 videos), “school” (966 times, 71 videos), “culture” (435 times, 71 videos), and “class/lecture” (424 times, 72 videos).

To analyze the co-occurrence network among keywords used on YouTube, 189 keywords appearing in more than 20 videos were extracted. Through this, 14,575 pairs of co-occurrence keywords were found, and 66 pairs of keywords that co-occurred in more than 10 videos were extracted to analyze the main keywords that appeared together. The keywords that appeared the most mainly consisted of content related to COVID-19 preventive measures such as “distance [-ing]” (41 times) and “quarantine, rules” (35 times), and content related to the library services, such as “loans, books” (20 times), “book, topic” (19 times), “operated, program” (14 times), and “lecture, content” (13 times). The top co-occurrence keywords are as follows in Table 2.

Centrality was measured to understand the location and network structure of keywords in the co-occurrence

**Table 2.** Top co-occurring keywords

Co-occurring keywords	No. of videos	Co-occurring keywords	No. of videos	Co-occurring keywords	No. of videos
Star, Gram	43	Video, Production	17	At home, Europe	13
Distance [-ing]	41	Loan, Service	17	Drive, Through	13
Subscription, Channel	35	Secondary, School	17	Era, Travel	13
Quarantine, Rules	27	Temporary, Closed	17	Children, Youth	13
Facilities, Use	24	Society, Region	14	Multiple, Use	13
Culture, Foundation	20	Operation, Program	14	Video, Program	12
Loan, Book	20	Wearing, Mask	14	Elementary, School	12
Online, Report	19	Lecture, Content	13	Method, Use	12
Book, Topic	19	Infection, Group	13	Lecture, Lecturer	12
District, Seodaemun	17	Travel, Europe	13	Culture, Art	11



(e.g., Instagram, administrators, homepages, channels, medical librarians), and Group 2 consists of keywords related to library users (e.g., school, youth, and children). Group 3 consists of keywords related to library quarantine and spread, and news about COVID-19 (e.g., news, COVID-19 positive, quarantine, report, and reporter), and Group 4 consists of keywords related to library work (e.g., loan, program, lecture, culture, reading). PageRank centrality, frequency, and the number of videos appearing from the most frequent keywords are shown in Table 3, and are arranged in descending order according to PageRank centrality.

#### 4.2. Video Analysis

YouTube videos related to library and COVID-19 issues are composed of various subjects and topics. In this study, topics were extracted based on the probability of keywords appearing in YouTube videos using the LDA technique, and the topic was derived by analyzing the documents related to the topic. Various K values (different numbers of topics) were used to derive meaningful results from the collected videos. The topic modeling parameters used in this study were as follows:  $\alpha$ : 0.1,  $\beta$ : 0.001, iteration: 5,000, and the final 20 topics were selected as K values. The probability of the appearance of 20 topics extracted from topic modeling among the total was analyzed. The topics that appeared more than 5% in frequency were Topic 1, Topic 3, Topic 4, Topic 9, Topic 10, Topic 12, Topic 15, Topic 17, Topic 19, and Topic 20, and 10 or more topics accounted for 65% of the total. Topic 9,

Topic 15, and Topic 3 appeared most frequently, and Topic 18 appeared least frequently. The label of each topic was selected by reviewing the probability of each topic, the top five terms for each topic, documents with a high probability (probability > 0.6) in each topic (the most relevant documents for each topic), and topics with similar topics, which were clustered to form the subject (Table 4). As a result of topic modeling, it was identified that YouTube videos are being produced under five major subjects: quarantine, vlogs, library identity during COVID-19, library services and functions, and library information and use guidelines.

The first major subject consists of topics related to the prevention of COVID-19 and includes Topics 2, 7, 6, 12, and 18. Topic 2 mainly deals with countermeasures of libraries such as library usage etiquette in the era of COVID-19. Topic 6 is about organizations applying the COVID-19 quarantine pass and related content, and Topic 7 mentions the closure of facilities due to COVID-19. Topic 17 focused on library disinfection, such as QR code verification for library access. Topic 18 consists of briefing videos on COVID-19 cases. Since the topics related to the prevention of COVID-19 contain videos containing news related to the library and general news about COVID-19, five topics were included, but all topics except Topic 12 accounted for less than 5% probability. The main keywords in Topic 12 are “prevention,” “facility,” “stage,” “spreading,” and “metropolitan area.”

The second major subject is vlog-related topics and includes Topics 3, 5, 13, and 15. The term “vlog” is a com-

**Table 3.** Analysis of high-frequency keywords

Term	PageRank centrality	Frequency	No. of appearances in YouTube	Term	PageRank centrality	Frequency	No. of appearances in YouTube
Channel	0.000535	482	75	Distance	0.000252	377	57
Culture	0.000373	435	71	Loan	0.000252	152	38
Use	0.000373	461	112	Book	0.000252	209	81
Report	0.000322	300	46	Society	0.000252	506	74
Reporter	0.000284	460	46	Travel	0.000252	223	25
Quarantine	0.000284	943	94	Video	0.000252	2,348	153
Children	0.000284	165	45	Europe	0.000252	176	14
School	0.000284	966	71	Program	0.000252	156	48
Confirmed	0.000284	822	43	Home Page	0.000214	174	76
Lecture	0.000252	95	38	News	0.000208	600	66
Class	0.000252	329	38	Formula	0.000207	167	34

**Table 4.** Topic modeling of YouTube videos

No.	Topic name	Probable terms	Probability	Subject
1	Education change and response in the time of COVID-19	Education, space, career, center, support	5.35	Library functions
2	Guide to using the library during social distancing	Social distancing, patient, society, occurrence, response	2.88	Quarantine
3	Librarian vlog	Video, Instagram, Facebook, YouTube, Life	5.35	Vlog
4	Class and lecture	Class, video, comments, youth, humanities	7.41	Library functions
5	Study in the library	Study, time, math, problem, concept	1.85	Vlog
6	Application of quarantine pass	Prevention, quarantine pass, vaccination, meeting, youth	3.09	Quarantine
7	Spread of COVID-19 infection and case update	Report, reporter, confirmation, infection, Seoul	4.73	Quarantine
8	Library tour during the time of COVID-19	Method, preparation, video, content, knowledge	3.70	Library introduction and use guide
9	Book circulation during the time of COVID-19	Service, loan, book, use, drive-through	9.05	Library functions
10	Introduction to schools and libraries in the time of COVID-19	School, student, university, class, grade	5.76	Vlog
11	Library lecture	Byeolmadang (Starfield), heart, society, Gunpo city, children, parents	3.91	Library functions
12	Quarantine due to the spread of COVID-19	Quarantine, facility, stage, metropolitan area, spread	5.14	Quarantine
13	Health information	Doctor, medical school, professor, digital, youth	3.09	Vlog
14	Library culture program	Culture, Seoul, art, neighborhood, foundation	4.94	Library functions
15	Users' library use	English, vlog, video, daily life, introduction	8.23	Vlog
16	Book curation	Literature, world, classic, earth, author	4.12	Library functions
17	Diverse trials of libraries during COVID-19	Reading, librarian, lifelong learning, citizenship, camping	6.99	Library's new identity
18	COVID-19 briefing	Confirmation, test, Daegu, quarantine, Ulsan	1.65	Quarantine
19	How to use the library during COVID-19	Children, video, performance, parliament, online	6.58	Library introduction and use guide
20	Library incentives during COVID-19	News, use, Daejeon, bookstore, application	6.17	Library's new identity

bination of “video” and “blog” and refers to video content that captures daily life as a video. Vlogs have become popular as a means of communicating with others by sharing individuals’ own daily lives online. Vlogs were categorized into those run by librarians or libraries and those run by users. Topic 5 and Topic 15 are vlogs created by users. Topic 5 contains the daily life of studying in the library, such as studying for exams and studying English during the COVID-19 outbreak, and Topic 15 contains the vlogs of users who use the library during COVID-19, such as dating in libraries and visiting the library in the time of

no face-to-face services. Topic 10 includes vlogs run by a librarian or library, containing the librarian’s book recommendations and the changed daily life of the librarian. Topic 13 contains a wide range of health information from medical librarians. Among these, the topic with the highest probability was Topic 15, and user vlogs about using libraries in various ways accounted for 8.23%, with librarians’ vlogs accounting for 5.35%. The main keywords of Topic 15 are “vlog,” “video,” “daily life,” “English,” and “introduction.”

The third major subject includes topics related to li-

brary orientation and use guides, and consists of Topic 8, Topic 10, and Topic 19. These topics are composed of videos that introduce the library space in contactless way during COVID-19 and give guidelines for using the library. Topic 8 focused on library tours during the COVID era, and Topic 10 is about the introduction to university, college, and school libraries during the pandemic, and is mainly directed at first-year student orientations and campus tours. Topic 19 is about library usage guidelines for children and consists of videos on how to use the library. Topic 19 had the highest probability (6.6%) and is composed of keywords such as “video,” “performance,” “online,” and “children.”

The fourth major subject consists of Topic 1, Topic 4, Topic 9, Topic 11, Topic 14, and Topic 16 and is about the main functions of libraries during COVID-19 (loan/returns, cultural programs, education, and lectures). Topic 1 mainly consists of library education videos about education and careers that have changed due to the COVID-19 pandemic, and the main keywords are “education,” “career path,” “center,” and “support.” Topic 4 includes library videos about humanities lectures, and the main keywords are “class,” “video,” “humanities,” “comment,” and “youth.” Topic 9 included introductions to loan/return services during COVID-19, and the main keywords were “service,” “loan,” “book,” “use,” and “drive-through.” Topic 11 was about classes/lectures delivered by the library, such as those about the message of child-rearing and happiness, and Topic 14 was about various library programs and consisted of keywords such as “culture,” “neighborhood,” and “art.” In Topic 16, it can be seen that keywords such as culture, world, and classic have become issues through book curation topics. Through this, it can be seen that the library was closed or operated limitedly in the early days of COVID-19, but as the non-face-to-face situation was prolonged, efforts were made to replace different functions of the library online. Topics 1, 4, 9, and 14 all exceeded 5%, and Topic 9 was the highest at 9% among the 20 topics, and Topic 4 was the second-highest at 7.4%.

The final subject emphasizes the changes of the library during the COVID-19 pandemic by reestablishing the identity of the library in that period. Topic 17 and Topic 20 fall into this category. Topic 17 shows the various efforts that libraries made to survive during the pandemic. For example, it includes videos about alternative uses of library space, such as camping in the library, the several efforts of librarians to provide digital library services, and online services of the library as a lifelong learning institution. The main keywords were “reading,” “librarian,” “life-

long learning,” “citizen,” “camping,” etc. Topic 20 includes videos dealing with contents such as bookstore rental services, late fee waivers, and book loans in advance as various efforts to revitalize library use which had been reduced due to COVID-19, and the main keywords are “use,” “bookstore,” and “application,” etc. Topic 17 accounted for 7%, and Topic 20 accounted for 6.2%, both accounting for more than 5% probability.

Table 4 shows the probability of the top five terms by topics. Terms in each topic are arranged in descending order based on the probability of occurrence of terms in the topic.

The following is the result of visualizing the topic modeling network and presenting it as a map (refer to Fig. 3). Topic 9, Topic 4, Topic 15, Topic 3, and Topic 19 showed the largest ego (node) size. Topic 9 (circulation/loan), with a high probability of appearance, was linked with Topic 14, Topic 17, Topic 20, and Topic 4. It can be seen that Topic 9 is connected to topics such as library services, diverse new attempts by libraries, and library incentives during COVID-19. Additionally, it can be seen that Topic 4 (class/lecture) is connected to various topics such as Topic 3 and Topic 15 (vlog), Topic 17 (different changes of the library), Topic 9 (library service), and Topic 19 (library use).

#### 4.3. Channel Analysis

The total number of channels that posted videos related to COVID-19 and the library issues and participated in comments and replies was 8,379. Channel analysis was carried out to identify influencers among the relevant users and to analyze the type of relationship created and the network flow. To this end, channels that posted the most videos, the number of video views and likes, the creator-commenter relationship, and the network between users (commenter-replier) were analyzed.

Of the 304 channels that uploaded videos, 55 were operated by libraries and two were operated by librarians. Looking at the distribution of the number of videos posted by channel, one channel posted 50 or more videos, 3 channels posted 11-20 videos, 5 channels posted 6-10 videos, 2 channels posted 5 videos, 10 channels posted 4 videos, 8 channels posted 3 videos, 39 channels posted 2 related videos, and 236 channels posted only one related video, showing that various channels posted videos related to COVID-19 and the library. Of these, 129 videos were posted by library channels, and three videos were posted by librarians. It was identified that 27.6% (132 videos) of the 479 videos were posted by libraries and librarians.

Because of analysis of the top 30 channels that up-

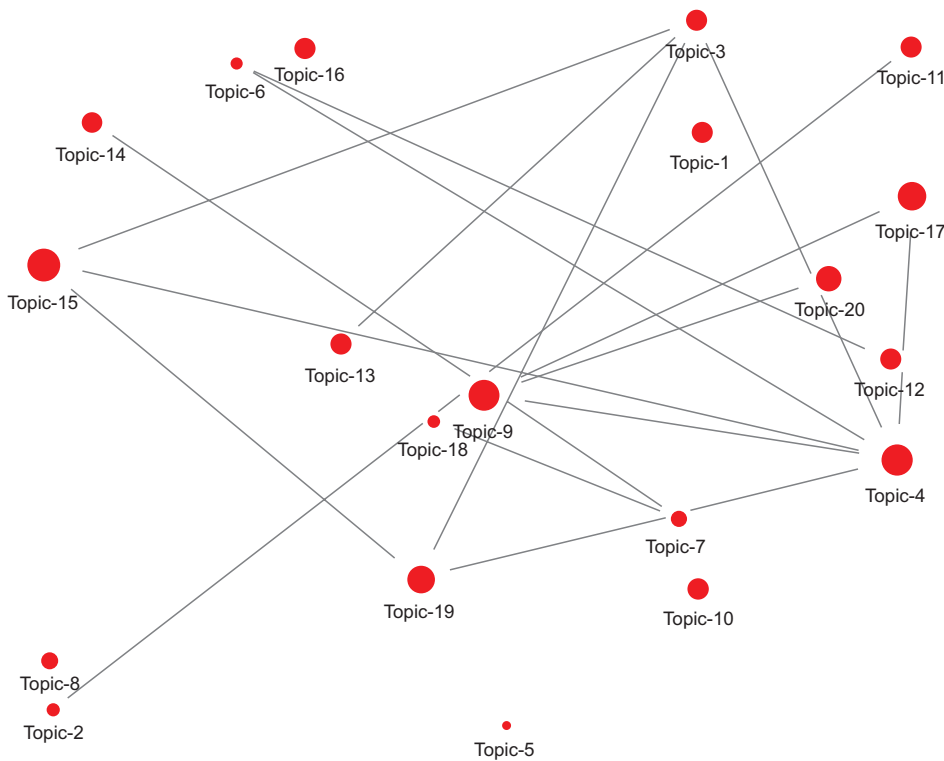


Fig. 3. Topic modeling network.

Table 5. Channel analysis of YouTube videos

	No. of node	No. of links	Density	Average degree	Clustering coefficient	Node connectivity	No. of isolated nodes
Upload-comment	7,152	6,578	0.00009	0.781	0.004	0	1,769
Comment-reply	4,704	4,088	0.00005	0.452	0.053	0	4,298

loaded three or more videos, 4 channels were operated by individuals, 13 channels were operated by libraries, seven channels were operated by broadcasting and news media centers, five channels were operated by government agencies, and one channel was operated by a company. In other words, it was identified that libraries were posting the most videos about COVID-19 and the library compared to other channels.

Network analysis of the uploader-commenter and commenter-replier links for all channels was conducted, and the research results are as follows (Table 5).

First, the results of the network analysis between the video uploader and commenter are as follows. Of the 7,152 nodes, 1,769 isolated nodes, which is 24.7% of the nodes, were not connected to other nodes, and the number of links was 6,589, which was less than the number of nodes, showing that many nodes did not form links with each other. The density was 0.00009 and the clustering

coefficient was 0.003, which is very low, and the average connectivity was close to 0, indicating that the network's cohesiveness is very low. Among the top 30 channels that posted the most videos, most of them had few or no comments except for news channels or personal vlog channels, so the network density is, inevitably, low. Because of network analysis between video creators and commenters, among the top 30 channels, only three channels were operated by libraries: Seocho Cultural Foundation (5th), Gyeonggi-do Cyber Library (13th), and Seodaemun-gu Library (30th). The rest were run by broadcast and news media centers (5 channels), schools (1 channel), government agencies (3 channels), and individuals (18 channels), with channels run by individuals making up the largest proportion. In particular, the average number of comments on posted videos was insignificant in the library channels, and it was found that libraries did not write comments on other videos related to "COVID-19 and the

library.” The COVID Seocho Cultural Foundation wrote 38 comments on 2 of 479 videos, and Gyeonggi-do Cyber Library and Seodaemun-gu Library wrote only one comment on one video each.

Second, the result of the network analysis of video commenters and repliers is as follows. Of the 4,704 nodes, 4,298 were isolated nodes, most of the nodes (91%) were not connected to other nodes, and the number of links was 4,088, which is less than the number of nodes. The density was 0.00005, the clustering coefficient was 0.053, and the average connectivity was close to 0, indicating that the network’s cohesiveness was very low as in the creator-commenter network. Of the top 30 channels with a large ego-network size and degree, only two were operated by libraries: the Seocho Cultural Foundation and Seodaemun-gu Library. The remaining 28 channels were operated by individuals. In other words, compared to individuals who are active in writing replies to comments on the video library, channels have a limited number of comments and are not active in communication activities such as replying to comments.

The following Fig. 4 shows the visualization of the network by selecting Fruchterman and Reingold’s layout (cooling coefficient 35; national length coefficient 1.0; maximum iterations 500) among the node layout algorithms. It shows that both the uploader-commenter and commenter-reply channel networks are distributed in multiple clusters, and many isolated networks exist at the bottom. In addition, it can be seen that the connectivity between different clusters or between nodes within a cluster is insufficient. Among the personal vlogs, vlogs about dating or studying in the library in daily life had the ego-

centered network with the largest ego size and the highest degree in the network cluster, so they are in the center surrounded by other users.

## 5. DISCUSSION

The results and implications of this study are as follows. First, co-occurrence and network analysis results showed that the keywords most used in “COVID-19 and the library” videos were “video,” “use,” “prevention,” “online,” “subscription,” “book,” “homepage,” “channel,” “progress,” “society,” “school,” “culture,” and “class/lecture.” The keywords that appeared the most from the co-occurrence keyword analysis mainly consisted of contents related to library services, such as “distancing,” “quarantine, rules,” “loan, book,” “book, topic,” “operated, program,” and “lecture, content.” The analysis of centrality showed that the keywords with high centrality were “channel,” “culture,” “use,” “report,” “prevention,” “children,” “school,” “confirmation,” “lecture,” “distance,” “loan,” and “book.” Through this, it was identified that the words most used in videos related to COVID-19 and the library consisted of terms related to COVID-19 news and library services or functions, and mainly videos related to these keywords were produced.

Second, 20 topics were extracted through topic modeling, and five subjects (quarantine, vlog, the library’s new identity in the time of COVID-19, library service and functions, library information and usage guide) were extracted. The subject related to COVID-19 quarantine included general news about COVID-19 and library-related news, such as library usage etiquette during COVID-19, disease prevention rules, library quarantine, closure and

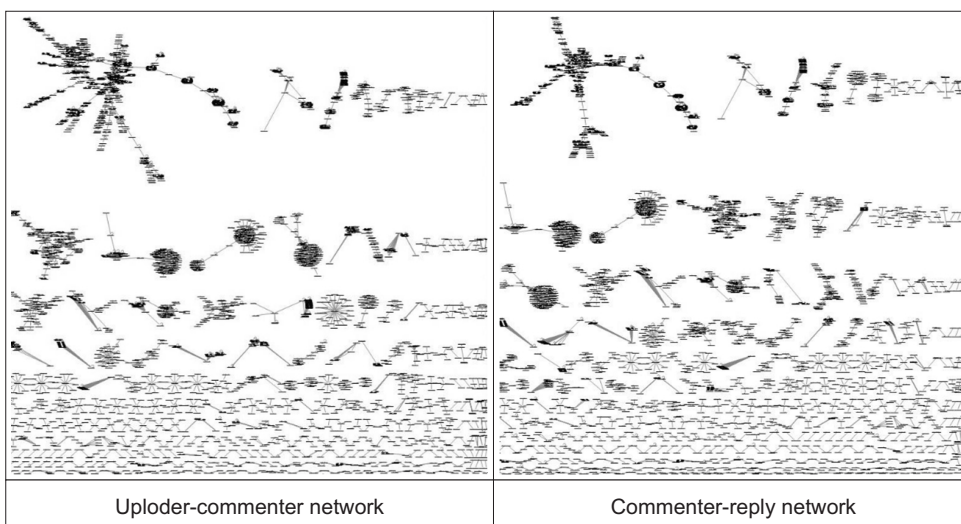


Fig. 4. Actor network.

partial reopening of facilities, COVID-19 prevention passes, and COVID-19 case updates. The subject related to vlogs is divided into vlogs run by the library and by the users. They contain topics about the daily life of librarians or library use in the daily life of users. The subject related to library information and usage guides included topics about the orientation of the library and how to use it. The subject of the library's main functions is composed of topics such as library classes/lectures, educational programs, cultural programs, and loans/returns. The last library-identity-related subject includes topics related to various changes and concerns of the library in responding to COVID-19, including topics such as providing incentives for library use during that time, changing library space, and emphasizing online services. In other words, it can be seen that differentiated videos related to libraries have been produced to respond to COVID-19, such as in library work, library identity, and library use.

Third, through the topic and keyword analysis, it was found that the library is attempting various countermeasures to overcome the changes during the COVID-19 situation and simultaneously find a sustainable operation plan afterward. Various methods were proposed, for instance, reorganizing the physical library space, encouraging the use of materials by allowing users to purchase desired books directly through bookstores, and reducing late fees. Additionally, it can be seen that libraries are thinking about ways to establish a library identity despite COVID-19, such as emphasizing online library services in the era of lifelong learning.

Fourth, through YouTube topics related to library tours and orientation, library circulation, and library functions and services, it was identified that in the early days of COVID-19, the library was closed or operated limitedly, but as the non-face-to-face situation was prolonged, efforts have been made to replace various library functions online. Varied library contactless services, such as online lectures and services of cultural programs, were provided through the YouTube platform. Simultaneously, libraries made continuous efforts to induce constant user interest in the physical library space and materials and reduce the impact on the library through videos on library tours and orientations, library loans/returns, and library usage.

Fifth, the discourse on library services during COVID-19 is being created by various participants such as libraries, news and media channels, government agencies, and individual users. Additionally, the role of the library as a producer of YouTube videos was confirmed through channel analysis. Of the 304 channels with 479 videos,

55 channels (18%) were operated by libraries, and library channels uploaded 26.9% (129) of all videos. Among the 30 channels with the highest number of videos posted, 13 (43.3%) were operated by libraries, accounting for the largest proportion. In other words, libraries were found to play a role in developing diverse services for users during the COVID-19 situation.

Sixth, it can be seen that a powerful influence is emerging on issues related to COVID-19 and the library. Additionally, it was found that the user density was low, and the connection between various actors like uploaders, commenters, and repliers was weak. Both the network between users who posted a comment-reply, and the network between the uploader and commenter showed low density and clustering coefficients, and many isolation networks showed a fragmented network that was loosely connected and divided into several clusters. Also, the connections between and within clusters were weak. This means that networks are created only in close friendships, and there is no external attempt to get out of the friendships. People who leave comments do so only on the videos they are interested in rather than commenting on many videos, meaning that the channel where the video is uploaded and the people who leave comments are different.

Seventh, findings showed that the centrality and density of the channels the library operated in the channel network were low. The library channel did not appear to comment on any other videos. The average number of comments/replies on the uploaded videos was also low. It can be seen that the videos created in the library channels are getting very few comments and very few likes, which means that they are not getting much attention reaching a wider audience. From this, it could be inferred that library channels are only used to upload videos related to the "COVID-19 and the library" topic and not as interactive channels to keep in touch with other users and other video publishers interested in this issue. This shows that the library plays a role as a content producer on YouTube, but not as an influencer. This implies that videos related to COVID-19 and the library may not reach more users as expected. This could be for a number of reasons. The library's YouTube channel may have had a low profile. It is also possible that the COVID-19 videos generated by libraries did not reflect users' interests. For this, it is vital to understand users' needs related to COVID-19.

Cooperation with various channel operators is vital, especially for channels with high influencing power or delivery rate. Efforts as active participants are required, such

as increasing the number of subscribers to channels operated by libraries or librarians, subscribing to channels that post videos related to other COVID-19 and the library topics, or writing comments and replies. Additionally, it is necessary to examine whether the contents in library and COVID-19 topics reflect users' library interests.

## 6. CONCLUSION

Due to COVID-19, the library has faced many challenges. This study explored the issue of "COVID-19 and the library" that appeared in YouTube videos. This study performed social network analysis and topic modeling analysis by collecting 479 YouTube videos, 20,545 terms, and 8,379 channels related to COVID-19 and the library from 2019 to 2020. Keyword network analysis, topic modeling analysis, and actor network analysis were performed.

This study can summarize that YouTube, a social media medium, was identified as an important platform for connecting users and the physical library, and for providing/promoting online library services. The library has provided user services in many ways in the COVID-19 situation and has been trying to connect online and offline libraries. The influence and importance of social media is growing day by day. Content production and dissemination are important to more actively inform the library's diverse changes and efforts to respond to COVID-19 through YouTube. For this, the library should cooperate with various channel operators related to the COVID-19 and the library issue, continue varied activities on the network as an active participant, and reflect on video user interests and needs.

This study is limited in that the data used in the analysis were only from 2019-2020 during the COVID-19 period. In the future, it will be necessary to check how the library discourse has changed through YouTube using time series analysis before and after the COVID-19 outbreak period. Additionally, this study was conducted on YouTube videos in South Korea. Conducting a comparative analysis using overseas YouTube will enable the comparison of differences in discourses. Future research should conduct time-series studies of how library discourse has changed on YouTube across different countries. This study is also limited in that it focuses only on YouTube and does not consider other social media platforms such as Facebook, where discussions about libraries and COVID-19 may occur. Therefore, the findings of this study may not be representative of the discourse about libraries and COVID-19 on social media.

Finally, this study did not compare the differences between the channel groups. A study that compares and analyzes the differences between major groups (libraries, librarians, individuals, government agencies, schools, news, and newspapers) that uploaded videos is necessary to reveal the characteristics of actors. However, the findings here have implications in that they identify that social media platforms such as YouTube are playing a more important role in disseminating information about library responses to the pandemic.

## CONFLICTS OF INTEREST

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

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# Knowledge Graph of Administrative Codes in Korea: The Case for Improving Data Quality and Interlinking of Public Data

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## ABSTRACT

Government codes are created and utilized to streamline and standardize government administrative procedures. They are generally employed in government information systems. Because they are included in open datasets of public data, users must be able to understand them. However, information that can be used to comprehend administrative code is lost during the process of releasing data in the government system, making it difficult for data consumers to grasp the code and limiting the connection or convergence of different datasets that use the same code. This study proposes a way to employ the administrative code produced by the Korean government as a standard in a public data environment on a regular basis. Because consumers of public data are barred from accessing government systems, a means of universal access to administrative code is required. An ontology model is used to represent the administrative code's data structure and meaning, and the full administrative code is built as a knowledge graph. The knowledge graph thus created is used to assess the accuracy and connection of administrative codes in public data. The method proposed in this study has the potential to increase the quality of coded information in public data as well as data connectivity.

**Keywords:** administrative code, public data, knowledge graph, data quality

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## 1. INTRODUCTION

Public sector data are closely related to the daily lives of citizens in terms of transportation, energy, administration, weather services, and so on. Governments and enterprises worldwide are actively working to promote the use of public data in all industrial fields (Jetzek et al., 2019; Wang & Shepherd, 2020). According to the European Commission, the expected total economic value of public sector information will be approximately 194 billion euros by 2030 (Barbero et al., 2018). By adopting national artificial intelligence strategies, most countries emphasize the disclosure of large-scale public sector datasets (HolonIQ, 2020). The Korean government is actively promoting the adoption of public data releases, and provides diverse legal and institutional support for their industrial use. Korea has positioned itself as a leading country in the international evaluation of public data (World Wide Web Foundation, 2017). According to 'Government at a Glance,' published by the Organisation for Economic Co-operation and Development (OECD, 2019), Korea ranks first in the open-useful-reusable government data index and fourth in the World Wide Web Foundation's Open Data Barometer, tied with France behind Canada, the United Kingdom, and Australia (World Wide Web Foundation, 2017).

However, the quality of public data remains inadequate for various reasons (Kim, 2019). In particular, public data are often incomplete or lack significant information (World Wide Web Foundation, 2017). Platforms for providing and sharing open data are expanding, and research on data quality is ongoing (Nogueras-Iso et al., 2021). To facilitate metadata-level interoperability and apply metrics to analyze metadata quality, a number of platforms implement standards such as data catalog vocabulary (DCAT) (Maali et al., 2014) and DCAT application profile for data portals in Europe (Kirstein et al., 2019). The quality of the values contained in datasets, on the other hand, remains a challenge. For example, the Korean government has established administrative codes for the common use of information by administrative agencies. A number of codes are established for simplifying government affairs. These codes are managed by government agencies supported by legal guidelines and information systems. The codes are systematically managed by government agencies, which may use existing codes for administration purposes but may also enact new codes if necessary. Information systems operated by individual agencies can use any and all codes registered with the code management system. However, as public data is disclosed in the government

information system, the gap between government and public data is widening. When data from a government information system is provided as public data, much contextual information tends to be excluded or lost. A dataset containing only code values creates a situation where users have difficulty understanding the meaning of the code; as a result, the dataset is difficult to link and combine with other datasets. Moreover, there is no way for the user to modify or enhance the value of public data to the government system.

Since public data including code values must ensure accuracy, information used internally by government and public data must be linked to each other so that they can be used as up-to-date information. To solve the current limitations associated with government codes, this study proceeds as follows: (1) a knowledge base of administrative codes for interlinking other datasets is created; (2) missing or improper values by the knowledge graph are revised and interlinked among the collected datasets. The knowledge graph can represent administrative codes in a machine-readable format and thus provide semantic relationships across public data. An ontology model is proposed to describe a set of administrative codes. Using this model, the administrative codes aggregated from the government code system are transformed into referenceable knowledge as a graph structure. The administrative codes are provided in Excel format without any relevant contextual information, making it difficult to understand and use the code in an open environment. All 314 established administrative codes were collected from the government code management system and transformed into a graph structure using our proposed knowledge model. The knowledge graph is then applied to five datasets for quality evaluation of public data; this process diagnoses the use status of administrative codes and evaluates the quality of each dataset. In particular, two metrics (completeness and accuracy) are used to determine the quality of columns matched to the administrative codes (Song & Kim, 2022; Vetrò et al., 2016).

The structure of this paper is as follows: the second section reviews previous studies. The third section describes administrative codes in Korea and methods for representing a knowledge graph. The fourth section describes the case of applying the constructed knowledge graph to public data from a quality perspective. The fifth section discusses several issues for utilizing the proposed approach. Finally, the concluding section summarizes the study and proposes future research directions.

## 2. RELATED WORK

A number of studies on open government data (OGD) have been conducted with respect to various subjects (Ubdii, 2013), including strategies (Wang & Lo, 2016; Yang et al., 2015), economic values (Zeleti et al., 2016), data quality (Vetrò et al., 2016), and technical implementations (Janssen et al., 2012). However, the efficient utilization of government data presents several particular issues. Crusoe and Melin (2018) conducted a systematic literature review to identify barriers to OGD. Most of these are technical, organizational, or legal (Crusoe & Melin, 2018). In particular, technical barriers are broad in scope, ranging from publishing the data to enabling consumers to use them. Assessment and quality control of published data are critical factors in the utilization of public data. Kubler et al. (2018) proposed an open data portal quality framework that aims to evaluate open data portals across 43 different countries. Vetrò et al. (2016) proposed a theoretical measurement framework to assess dataset quality. The approach proposed here focuses on quantitatively assessing the quality of government datasets rather than evaluating open data portals.

Various studies have considered linked data for semantic linking of public data. Linked data interlinks among various data sources and is dependent on the quality of individual datasets. Shadbolt et al. (2012) stated that the massive influx of heterogeneous data without semantics or structure has become a problem affecting OGD. Furthermore, researchers have claimed that combining OGD with linked data technologies can leverage the scope and richness of government data because additional resources become interlinked with appropriate contexts (Shadbolt et al., 2012). Researchers are actively investigating the application of linked data technology at the national level in Brazil (Breitman et al., 2012), Singapore (Raamkumar et al., 2015), and Serbia (Janev et al., 2018). Multiple studies have been conducted in specific domains, such as statistical data (Han & Lahiri, 2019; Höffner & Lehmann, 2014), legal data (Mockus & Palmirani, 2017), and data quality and assessment (Ibáñez et al., 2019). Matsuda et al. (2018) established a unified structure for publishing and using statistical data with standard vocabularies such as resource description framework (RDF) and SPARQL (SPARQL Protocol and RDF Query Language) for the Japanese statistical center. Several researchers have presented specific ontology models to represent OGD in a semantic model

(Ferneda et al., 2016; Jiang et al., 2019; Petrušić et al., 2016; Zeleti et al., 2016). For instance, Lamharhar et al. (2015) introduced a knowledge-based technique for the automatic processing of heterogeneous public administrative bodies for e-government domains. Daraio et al. (2016) proposed ontology-based data management for a comprehensive level of interoperability among different open datasets, including a data management strategy, high-quality semantic annotation, and ontology mapping.

Governments worldwide and international organizations provide various types of data and classifications as linked data, such as the Global Standards One web vocabulary (Harrison et al., 2014) and legal entity identifiers (Trypuz et al., 2016). In particular, the linked data registry developed by the Commonwealth Scientific and Industrial Research Organization provides vocabulary, ontologies, and reference resources authorized or adopted by it.<sup>1</sup> The Australian government provides the Classification of the Functions of Government (COFOG), defined by the United Nations as linked data based on the simple knowledge organization system (SKOS) model.<sup>2</sup> Moreover, the Australian government architecture framework assists in the delivery of more consistent and cohesive services to citizens and supports the cost-effective delivery of ICT (Information Communications Technology) services by the government. This framework contains a set of reference models for collaboration within and across agencies. In particular, the data reference model aims to deliver consistent data context as the basis for data governance, which can be achieved using an ontology-based approach (Australian Government Information Management Office, 2011). The Italian National Institute of Statistics and the Agenzia per l'Italia Digitale provide an official classification system in a linked data format by linking COFOG, Public Record Office Victoria (Lebo et al., 2012), and the eXtended knowledge organization system (Lodi et al., 2014). From the perspective of public data, these efforts can be considered to increase the connectivity and accuracy of data by consistently referencing codes, classification systems, and vocabularies used by governments. Kim (2018) proposed a knowledge model to represent the legal definition of administrative districts and their interrelationships in Korea and demonstrated the interlinkage of various elements such as addresses, postal codes, hospitals, and schools in an administrative-district knowledge graph.

Because there is insufficient quantitative research on

<sup>1</sup><http://registry.it.csiro.au>

<sup>2</sup><https://github.com/CSIRO-enviro-informatics/cofog-a-vocab>

the use of administrative codes for public data, this paper proposes a method for incorporating an administrative code into a knowledge graph to improve data quality. The proposed knowledge graph can represent administrative codes in a machine-readable format; the dataset generating the knowledge graph establishes a semantic relationship across public data.

### 3. A KNOWLEDGE GRAPH OF ADMINISTRATIVE CODES

#### 3.1. Overview of Administrative Codes in Korea

An administrative code refers to a code system that can be classified in the administrative work of each level of government agency so that they can be handled easily according to a certain code (Ministry of the Interior and Safety [MOIS], 2017). In Korea, the administrative standard code is a set of administrative codes established and published according to the prescribed procedure by standardizing the administrative code required for the administrative work of each level of agency. Note that an administrative code is designed with the goal of classifying and simplifying public agency administrative tasks. The administrative standard code in Korea is a particular type of administrative code that establishes a set of codes necessary for standardizing each agency's administrative work. The term 'standard' refers to code that is the product of government legislation, and is semantically different from general standards in the ICT field. Therefore, this study refers to administrative code rather than administrative standard code.

The Electronic Government Act (MOIS, 2017) provides the legal basis of the administrative code for operating and managing administrative code sets. The purpose of this act is to implement e-government effectively by prescribing basic principles, procedures, and methods for the electronic processing of administrative affairs. According to Article 50, the Korean MOIS may establish a set of administrative codes as needed for sharing administrative information across government agencies. In addition, it may publish them in the official gazette (Article 59, Paragraph 1 of the enforcement decree of the Act) and the head of the administrative agency should comply with the codes established in accordance with Article 59, Paragraph 3. The administrative code covers central administrative agencies (including agencies reporting directly to the president and prime minister), agencies affiliated with

central administrative agencies, and local government agencies. The Korean government recommends the use of the administrative code in general administrative affairs via specific guidelines: (1) all agencies should use up-to-date administrative code from the administrative code management system,<sup>3</sup> (2) a new informatization project should use the administrative code; if the existing codes cannot be applied, the institution must consult with MOIS in advance to derive application plans, and (3) if the administrative code has not yet been applied in the existing information system, the organization should discuss applying the code and improving interoperability between systems with MOIS.

Eleven types of administrative code were enacted in 1990 to promote e-government. These have been expanded to 314 types through several additional enactments and supplements. All currently established administrative codes are managed through the administrative code management system. The administrative code is classified into 26 subjects as administrative tasks. Note that the administrative codes represent individual subjects as strings, but there is no consistent method for identifying individual subjects. To identify them, all subjects and codes were defined by an 'S' and 'AC' (Administrative Code) and an arbitrarily assigned number. By subject (Fig. 1), S15 (personal administration) and S21 (local tax payment) were the most numerous with 29 codes (9.24%) each, whereas S2 (construction), S20 (local taxation), and S4 (transportation and logistics) had 25 (7.96%), 24 (7.64%), and 19 (6.05%) administrative codes, respectively.

Each code has a 1:1 match between code value and its meaning. The code value is detailed according to a specific subject as a simple number or blended with other characters, whereas its meaning is a name expressed in natural language. By default, each code consists of a value, a code name, and a comment as a column. The number of columns ranged from a minimum of three (97% of codes) to a maximum of 25. Note that eight administrative codes have more than three columns; as shown in Fig. 2, AC56 (national license), AC17 (construction classification), AC243 (functional category), AC192 (postal code), AC247 (job position), AC61 (international currency), and AC211 (type of disability) have more than four columns, while AC67 (organization), AC83 (road name), AC246 (job classification), AC164 (raw food material), AC298 (university major), AC162 (qualification test), AC79 (standard item), AC163 (food safety classification item), and AC242 (job

<sup>3</sup><http://code.go.kr>

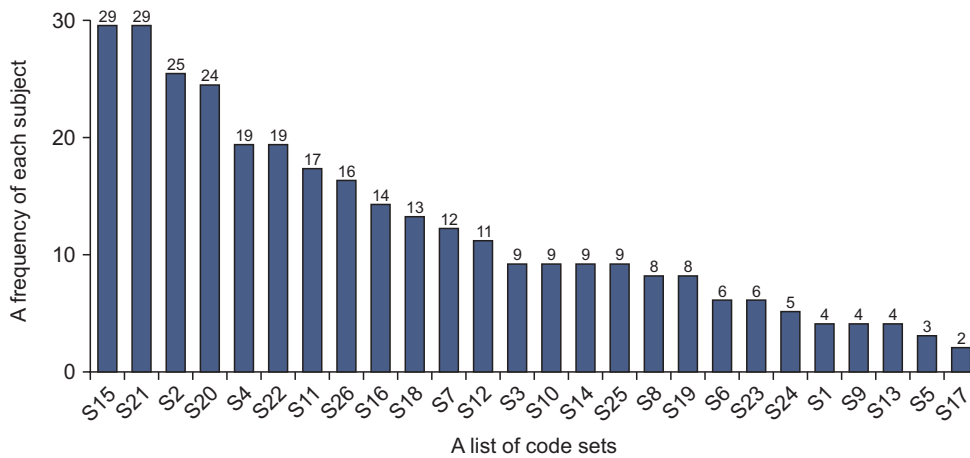


Fig. 1. Statuses of data by subject.

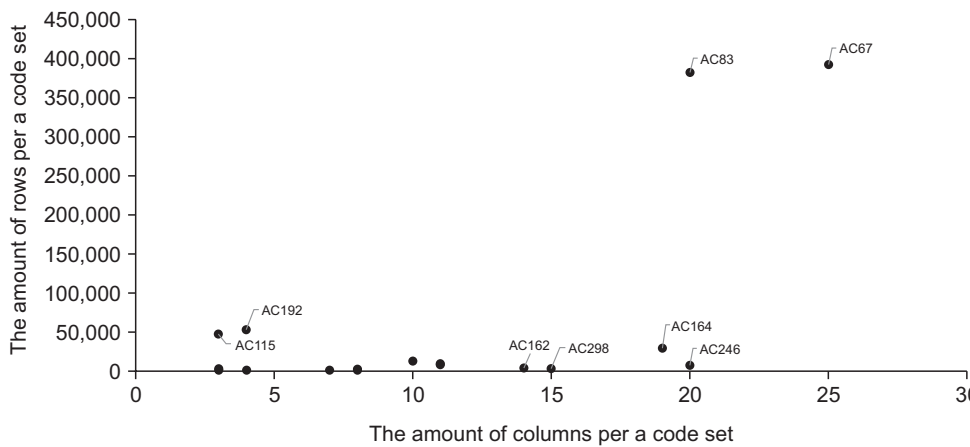


Fig. 2. Data status by the number of rows and columns. AC67 (391,377), AC83 (381,415), AC164 (28,337), AC246 (6,690, job classification), AC162 (6,690, qualification test), and AC298 (2,592, university major) have a relatively large number of codes and values.

class) have more than 10 columns. The number of rows in the datasets varied from a minimum of two to a maximum of 391,377. The number of rows is 10 or less for 43% and between 11 and 100 for 41%; approximately six (2% of code types) contain 10,000 or more codes. In particular, AC67 and AC83 have the largest number of columns and rows (25×391,377 and 20×381,415, respectively) because they contain detailed specifications of items in addition to the code values, as shown in Fig. 2. Although AC192 (postal code) and AC115 (administrative district) contain four and three columns respectively, they contain 52,284 and 46,215 codes, respectively. These datasets define all postal codes and administrative districts in the Republic of Korea. These codes are commonly used in government and national information systems.

### 3.2. Knowledge Model

Some existing vocabularies are repurposed to represent the administrative codes at a semantic level, namely schema.org (Guha et al., 2015), RDF (Brickley et al., 2004), and

SKOS (Miles & Brickley, 2005). For example, a set of descriptive information is represented by RDF, while the relationship between concepts is described using SKOS. New terms are defined only if they do not correspond to the existing vocabulary. In schema.org, the CategoryCodeSet class describes a set of category code values. CategoryCode expresses a short textual code that uniquely identifies the value using the codeValue property. The two classes can be linked with the hasCategoryCode property, which aims to represent a code contained in a code set. To represent a set of administrative codes, the AdministrativeCodeSet and AdministrativeCode classes are defined as subclasses of the CategoryCodeSet and CategoryCode, respectively. These classes inherit the relationships defined in schema.org. Thus, the hasCategoryCode property of schema.org is reused to connect to both AdministrativeCodeSet and AdministrativeCode. In addition, each code set has one subject and one category; the Subject and Category are subclasses of skos:Concept. The category and subject properties are linked to the corresponding code set.

As shown in Fig. 3, several classes are defined to represent the characteristics of administrative codes. Each code set is maintained by at least one government body. The organization property describes an agency that creates or operates a specific code set. The expected value of this property is a type of Organization within schema.org. A management of organizational codes is classified into four types: general, competent, application, and consignment. The general organization manages overall tasks such as the designation of the competent agency (department) of the administrative code, management of enactments/visions, and notifications. Competent organizations manage the establishment and revision of sets of administrative codes. Application organizations are responsible for applying administrative codes to an internal information system. Thus, these types are defined as types of Organi-

zation classes. Table 1 lists four types. The administrative codes are classified into four management types according to the characteristics of the competent organization. The management type is defined by the ManagementType class. The AdministrativeCodeSet class can be linked to a specific management type with the managementType property.

The URI (Universal Resource Identifier) pattern is designed to be consistent and predictable. The experiences and recommendations of linked data communities, including data publishers and consumers, are used to develop common patterns and practices (Juty et al., 2020). A vocabulary URI includes ontology, vocabulary, concept schemes, and code sets. The pattern, combining a domain address and a reference item, is an important resource. The reference item contains the reference data. In this

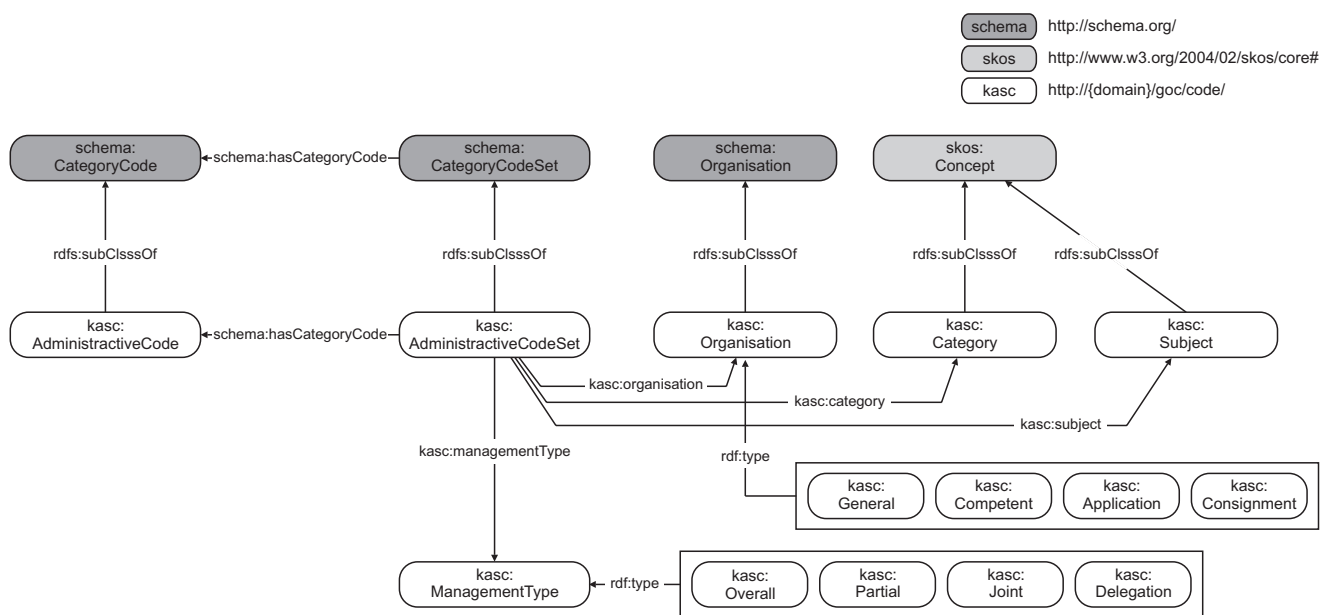


Fig. 3. Abstract model of administrative code representation. The prefix of the namespace is 'kasc' (Korean Administrative Standard Code).

Table 1. Management types and classes in the knowledge model

Management type	Class name	Description
Overall	kasc:Overall	The code is managed by one competent organization.
Partial	kasc:Partial	If the competent organizations of each part differ, the competent organization (department) for each part may be determined.
Joint	kasc:Joint	If there are multiple agencies in charge of one code, these can be designated, and the change can be managed through a mutual agreement.
Delegation	kasc:Delegation	When it is difficult for the competent organization to directly manage the change management of the lowest code value, the change management function can be delegated to the subordinate organization.

case, a reference item is a government agency, and the reference data are the administrative codes provided by the agency. This relationship is represented by the URI pattern ‘gov’ and ‘code,’ listed in a specific order. Furthermore, the vocabulary and instances of the subject are defined by classifying them into ‘def’ and ‘id,’ respectively. Therefore, the vocabulary URI is provided at `http://{domain}/gov/code/def`. Note that the individual ontology vocabulary is expressed in CamelCase notation such as ‘`http://{domain}/gov/code/def/AdministrativeCodeSet`’ and ‘`http://{domain}/gov/code/def/AdministrativeCode`.’ The URI for representing the dataset is defined as ‘`http://{domain}/gov/code/id`.’ However, because administrative code values have a relatively simple composition (e.g., ‘01,’ ‘02,’ and ‘03’), it is difficult to ensure the uniqueness of the code URI using only the code value. Therefore, a code identifier is defined by combining code set numbers and code values. For example, instances of the `AdministrativeCodeSet` and `AdministrativeCode` classes are defined by combining the individual code value (AC) of the administrative code with the serial number assigned to the code data. The AC

creates combinations of administrative code data and code values (e.g. ‘`http://{domain}/gov/code/id/AdministrativeCodeSet/AC/{code set number}`’).

All code datasets, containing 1,011,438 individual codes, were downloaded individually as Excel files. The knowledge graph conversion was done using Python and RDFLib,<sup>4</sup> and the linking of the government code contained in the open data was done using OpenRefine’s reconciliation service. These codes are transformed into graph-structured data by adopting the proposed knowledge model and the URI model. The administrative code as constructed by the knowledge graph contains approximately 1,011,812 entities and 20,481,472 statements. Table 2 summarizes the entities and statements for each subject in the knowledge graph.

## 4. EVALUATIONS

### 4.1. Data Collection

A small-scale evaluation was conducted to verify the use of knowledge graphs for public data. On the public

**Table 2.** Statistics of the knowledge graph by administrative code

Category	Type	Description	Entities	Statements
Metadata	Organizations	Agencies that manage the administrative codes	34	248
	Subject	Topics that are classified by government tasks	26	208
Administrative code	Code set	Total number of the administrative codes	314	23,496
	Code	Total number of individual codes	1,011,438	20,457,520
Total			1,011,812	20,481,472

**Table 3.** List of public datasets from the Korean open data portal

Dataset	Description	ID	Columns	Rows	Views	Downloads	File size
D <sub>1</sub>	Administrative organizations in Korea	15061082	8	13,460	360	233	2 MB
D <sub>2</sub>	Public health and medical institution	15004305	15	227	3,380	874	51 KB
D <sub>3</sub>	Medication prescriptions	15007117	15	36,380,226	4,326	16,709	3.27 GB
D <sub>4</sub>	Current status of the beauty industry in Gyeonggi Province	15038408	37	1,200	266	162	266 KB
D <sub>5</sub>	National parking lots	15012896	33	14,609	-	-	4.1 MB

The ID column is an identifier assigned by the public data portal, and the ID for accessing the actual data is ‘`https://www.data.go.kr/data/ID/fileData.do`.’ However, D<sub>5</sub> has a different URL (`https://www.data.go.kr/data/15012896/standard.do`) owing to the type of standard data.

<sup>4</sup><https://rdflib.readthedocs.io/en/stable>

data portal,<sup>5</sup> a search for the keyword ‘public’ was conducted and the top five datasets were selected from the results. As shown in Table 3, Dataset  $D_1$  contains types, addresses, and phone numbers of administrative agencies such as post offices, public health centers, and administrative division offices. Dataset  $D_2$  contains information about medical institutions, including the type, number of beds, and addresses. Dataset  $D_3$  is composed of details of individually prescribed medicines (e.g., date of commencement of treatment, appropriate dosage, daily dose, and total dose) on one million patients per year. Dataset  $D_4$  provides the names of businesses in the city of Icheon in Gyeonggi Province such as hair, makeup, and nail art studios, as well as licensing dates and business status. Dataset  $D_5$  provides information on the addresses, locations, types, operating times, and fees for parking lots nationwide.  $D_3$  is a very large dataset (approximately 3.27 GB) with the maximum number of rows, whereas  $D_4$  is relatively small because its data are limited to a specific region. The ‘Views’ and ‘Downloads’ columns represent the numbers of users who previewed or downloaded the file contents via the portal. The portal does not indicate the number of views and downloads of  $D_5$ .  $D_3$  has high numbers of downloads, but the other datasets have low numbers compared to the number of views. This suggests that users discover and review these datasets but generally do not download them for actual use.

Individual datasets use administrative codes ranging from 11% to 75% of the total. In  $D_1$ , for example, six out of eight columns use administrative codes, while in  $D_5$ , only 4 columns out of 36 are used. Table 4 summarizes the column to which the administrative code was applied, the matching administrative code, and the results of data quality improvement in the dataset. Matching with administrative codes proceeds in two steps. First, the column value of the dataset determines selection of the category type and comparison with the administrative code. Since the Korean column names are used as different character strings, whether or not they are semantically equivalent to the administrative code names can be determined. In fact, although the column names of the datasets are different, the same administration code is applied. For example, ‘Organization type’ in  $D_1$  and ‘name of management institution’ in  $D_5$  can apply the same administrative code. There are 108 columns in the collected dataset and 22 (20%) of them have administrative codes. Ten administrative codes were used in the collected datasets by applying semantic

matching: AC41 (public health industry), AC67 (public organization), AC115 (administration division), AC117 (healthcare institution), AC136 (sex), AC166 (type of food hygiene business), AC192 (postal code), AC227 (type of parking lot), AC241 (job position), and AC314 (closed status of business). Ordinarily, one code value or name was applied to each dataset. Most matched columns tend to use code names rather than code values. However, C20 and C21 of  $D_5$  (provider of name and code, respectively) are the only exceptions in which both values are used together. Note that the percentage of matches across all columns in the dataset was approximately 20%, whereas 36,409,722 rows had administrative code values.

## 4.2. Data Quality

Individual data sets can use codes or code names as column values. The values in the combined data set, on the other hand, may include a string whose code value is unknown, or a portion of the extracted value rather than the entire code. For example, Seoul Metropolitan City’s administrative code is ‘1100000000’; however, depending on the institution, only two (‘11’) or five (‘11000’) digits may be indicated in front. These values reduce the data’s accuracy. Two metrics ( $C_{mc}$  and  $A_{mc}$ ) were used to assess the quality of each dataset: the completeness index ( $C_{mc}$ ) refers to the proportion of rows in a specific column that are non-empty and have meaningful values compatible with the domain of the column, while the accuracy index ( $A_{mc}$ ) indicates the percentage of cells for a specific column that have values consistent with the administrative code. The evaluation was conducted in two steps: (1) Determine whether the column value of the collected dataset corresponds to the administrative code value; and (2) re-evaluate the match by correcting some of the column values that did not correspond in step 1. Using the results of the secondary evaluation to ascertain the accuracy, all matched values were converted to the URI of the knowledge graph.

The completeness scores  $C_{mc}$  are 0.99 and 1 in the first and second evaluations, respectively, as shown in Table 4. That is, most column values do not have null values or empty strings. Column C16 of  $D_4$  has 181 blanks, however, with a completeness score of 0.85. It includes a zip code, and the correct value can be added in the second evaluation through the address column. By contrast, the average accuracy score  $A_{mc}$  for the first evaluation was 0.65. This score was relatively low compared with the complete-

<sup>5</sup><http://data.go.kr>

**Table 4.** Summary of data column match quality evaluation (the column name is the English translation of the Korean name in the original data)

Datasets	Matched columns (matched/total)	Matched ratio (%)	Columns	Name	Matched code set	1st matched result		2nd matched result	
						C <sub>mc</sub>	A <sub>mc</sub>	C <sub>mc</sub>	A <sub>mc</sub>
D <sub>1</sub>	6/8	75	C1	Organization type	AC241	1	0.25	-	0.25
			C2	Organization sub-type	AC67	1	0	-	0.31
			C3	Representative organization name	AC67	1	1	-	-
			C4	Full organization names	AC67	1	0.64	-	0.87
			C5	Subordinate organization	AC67	1	0.68	-	0.92
			C6	New postal code	AC192	1	1	-	-
D <sub>2</sub>	5/15	33	C7	Medical institute name	AC67	1	0.24	-	0.72
			C8	Name of related administrative agencies	AC67	1	0.77	-	0.99
			C9	Related public organizations	AC67	1	0.13	-	0.77
			C10	Types	AC117	1	0.95	-	0.95
			C11	Zip code	AC192	1	0.84	-	1
D <sub>3</sub>	2/14	14	C12	Gender code	AC136	1	1	-	-
			C13	City and province codes	AC115	1	1	-	-
D <sub>4</sub>	4/38	13	C14	City and county name	AC115	1	1	-	-
			C15	Name of business status	AC314	1	0.5	-	1
			C16	Road-name postal code	AC192	0.85	0.85	1	1
			C17	Information of business category name	AC166	1	0	-	0.7
D <sub>5</sub>	4/36	11	C18	Information of hygiene business name	AC41	1	0	-	0.93
			C19	Types of parking lots	AC227	1	1	-	-
			C20	Name of management institution	AC67	1	0.05	-	0.97
			C21	Provider name	AC67	1	1	-	-
			C22	Provider code	AC67	1	0.68	-	1
Average scores						0.99	0.62	1	0.88

For clarity, column names are represented by the combination of the string 'C' and the index number.

ness score. In other words, the column value to which the administrative code is applied does not exactly match the administrative code. Accuracy is verified by applying fingerprints provided by OpenRefine's Key Collision methods to verify code values (Carlson & Seely, 2017). The Key Collision approaches are predicated on the concept of constructing an alternate representation of a value ("key") that contains just the most valuable information. The fol-

lowing inaccuracies can be found in columns with low accuracy:

- Type I - Unmatched categories (C1, C2, C10, C15, C17, C18): C1 of D<sub>1</sub>, C10 of D<sub>2</sub>, and C17 of D<sub>4</sub> contain organizational job classifications, hospital types, and business categories, respectively. C1 contains novel composite information derived from merging

categories defined in AC241 with categories found solely in the dataset. Some categories are matched, but the AC241 categories are connected with the ‘\\_’ symbol, or else new categories that are not mapped at all are generated. The administrative codes for C10 and C17 are AC117 and AC166, respectively; however, they also include categories that do not exist in the administrative codes. Meanwhile, C17 does not use the administrative code (AC166: beauty industry), despite the fact that this code exists. Instead, there is a new value in this column.

- Type II - Use of incomplete codes (C4, C5, C20, C22): AC67 includes comprehensive information about administrative agencies. Organization names, for instance, are given by splitting them into columns labelled ‘full organization name’ and ‘organization name’, respectively. The column ‘full organization name’ shows all of the organization’s related relationships, and higher- and lower-level links are separated by spaces. For example, because the ‘National Archives of Korea’ are part of the Ministry of Public Administration and Security, the full organization name is written as ‘The Ministry of Public Administration and Security National Archives,’ while the column ‘organization name’ only includes the organization name without the higher affiliated institutions. If the affiliation relationship is complex, only a portion of the values are taken and used; hence institutional names in the collected data set are inconsistently indicated. C22 comprises codes that are not in the category, and a portion of the code value is modified and used instead of the entire code value.
- Type III - Composition of complicated information (C7): In  $D_2$ , C7 is a combination of administrative districts and medical institution names. As a result, the matching rate for the value of AC67 was low (0.24) in the initial evaluation.
- Type IV - Inclusion of special characters (C2, C8, C9, C18): Some values of C2 and C18 are used by linking them with the ‘\\_’ symbol. C8 and C9 have detailed parenthetical values of 52 and 192, respectively. C18 employs AC41 with the ‘\\_’ symbol as well as four extended code names (82 rows) that do not exist in AC41.
- Type V - Blank values and error values (C11, C16): C11 has 35 postal codes expressed as prior address

system values, while C16 has 181 values marked with blanks.

Data cleaning can be approached in a variety of ways depending on the type of inaccuracy. Quality improvement is difficult for Type I due to codes that do not exist in the administrative code, so that data refinement does not significantly increase accuracy. For example, the accuracy of C1 and C2 is relatively poor, at 0.25 and 0.31 respectively. In the event of such an issue, it is preferable to register the newly produced or extended code in the administrative code management system and update the open data. Types II and III were improved by separating data values into minimum semantic units and implementing reconciliation services with administrative code provided by knowledge graphs. For example, all C4 values are separated by spaces, and values that match the organization name represented by the knowledge graph are searched. The knowledge graph depicts the hierarchical structures and relationships between organizations in AC67. Through the reconciliation, the separated value finds a matching value and is linked to the knowledge graph’s entities. By deleting embedded special characters and whitespaces, Type IV errors can be significantly reduced. Finally, for Type V, the value is either blank or contains the preceding address system’s value associated to the address. First, blanked fields in C11 received the address value by searching for and entering the hospital name in the address API.<sup>6</sup> C16 addresses include a postal code, a road name, and a lot number. Cells with no postal code were added by utilizing the address API to look for the value of the record’s street name or lot number address. The second matching result refers to the refined data. The completeness score increased from 0.99 to 1, while the accuracy score increased from 0.62 to 0.88. However, because administrative codes and other codes and categories exist in separate datasets, perfect accuracy cannot be guaranteed.

#### 4.3. Data Interlinking

Public data can be combined or integrated with other publicly available data. However, various datasets necessitate the use of common values or standards for integration. The administrative code knowledge graph is a graph structure that gives the structure and value of administrative codes as a standard vocabulary, and it may be used to connect data based on administrative codes included in

<sup>6</sup><https://business.juso.go.kr/addrlink/openApi/apiExprn.do?cPath=99JA>

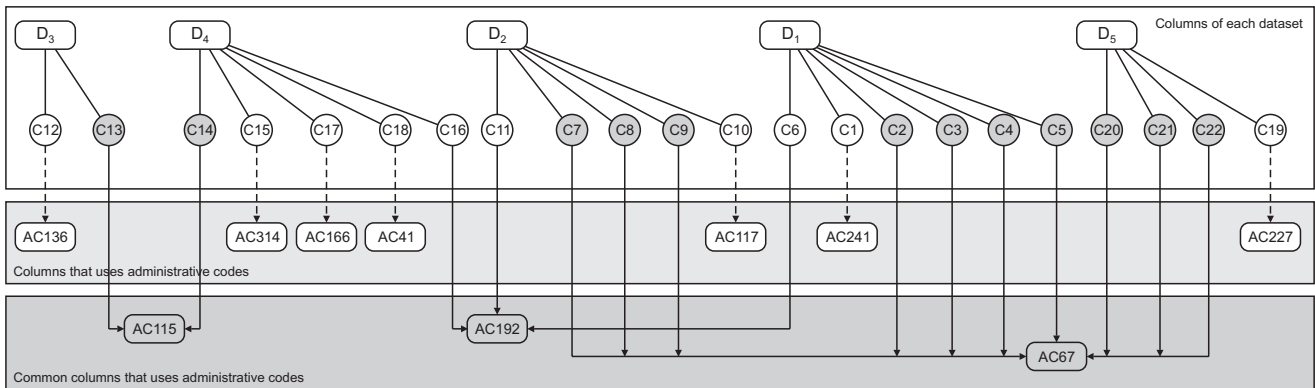


Fig. 4. Interlinking between datasets with the administrative codes.

public data.

In the five datasets studied here, 22 columns were mapped to the administrative codes. Seven codes were used only in individual datasets, and three codes were commonly used across datasets. Fig. 4 illustrates the relationships among the five datasets based on administrative codes. The established knowledge graph provides a consistent identifier of individual codes, allowing each code to be used to interlink datasets. Although the column names (in Korean) defined in datasets are different, the columns that use the same administrative code are semantically interlinked by the knowledge graph. Codes commonly used between different datasets can be used as reference points for linking them. In particular, AC67 (organization) is commonly applied to 11 columns. This code can be widely used for public data. The administrative division code for C13 of D<sub>3</sub> and C14 of D<sub>4</sub> are the same. Additionally, D<sub>1</sub>, D<sub>2</sub>, and D<sub>4</sub> commonly use AC192. For example, if relevant datasets exist with the administrative codes, use cases would be extensible.

There is a limit to generalization of the proposed method based on only five datasets. In the aforementioned example, not all datasets can be linked by an administrative code. However, independently used codes can be used to link different datasets. By constructing the administrative code as a knowledge graph, the task of individually verifying and evaluating the values of a dataset can be significantly reduced, and this can be a starting point for discovering opportunities for linking datasets. In other words, the knowledge graph provides a common criterion for linking various datasets and can present relationships between datasets in a way that computational algorithms can understand.

## 5. DISCUSSION

By converting administrative codes used in government administrative affairs into knowledge graphs, this research presents a strategy for improving the quality of public data and linking different data with administrative codes. Because information on administrative codes contained in public data may be lost throughout the process of disclosure to the private sector, the method suggested in this study can be used to improve the quality of public data. However, because public data encompasses information from multiple domains and public sectors, it must be augmented.

- Expansion of codified data: The administrative codes are governed by law (MOIS, 2017). Classification codes that are not registered as administrative codes, on the other hand, are commonly utilized. Searching the public data site for ‘classification code’ yields around 4,609 datasets, but not all of them contain administrative codes. The Korean Statistical Classification is a code system that systematically categorizes economic activities performed mostly by businesses based on their commonalities. Other than for statistical purposes, this code is frequently used in general administrative and industrial policy domains, and it is also included in public data: The Korean Standard Industrial Classification ensures the accuracy and comparability of industry-related data, while the Korean Standard Classification of Occupations is used for classifying and aggregating occupational information obtained through statistical censuses and surveys, and the Korean Standard Classification of Diseases and Causes of Death is used for classifying diseases and other health prob-

lems recorded on many types of health and vital records. Coded data identifies datasets and simplifies data linking by using common coding. As a result, it is vital to investigate linking active codes in the public and private sectors.

- Consistent updating of disclosed codes: Because administrative code was originally developed for government operations, it is difficult to examine code modifications and new information from the commercial sector in real time. Although administrative codes included in public data can be universally accessed via knowledge graphs, it is difficult to provide exact values for public data containing codes that do not fit the administrative code registration system. For instance, new code registration is restricted to public institutions, making it impossible for public data users to submit comments. If it is legally difficult to directly edit or register the code in the private sector, the provider of public data can consider modifying the code data and re-opening it by gathering opinions. On the other hand, it is necessary to check the association with a categorization system that is not registered as an administrative code throughout this process.
- Administrative code system: Administrative codes are opened in the registration system as Excel files. While individual codes include codes and code values, the majority of individual codes are represented by numbers such as 1, 2, and 3. As a result, code values cannot be utilized to identify specific codes. Because the role of administrative codes is growing more significant and its study is developing, an adequate identification system must be established. On the other hand, the meaning of the code value offers only a plain string, which is insufficient to interpret the meaning. As a result, the code value must be added and described in full. Because there is no relationship between individual codes, the method must be reviewed for thorough expression of the relationship between organizations, subjects, and codes. The SKOS-based data model suggested in this paper can serve as a starting point for expressing the link between administrative codes.

## 6. CONCLUSION

This paper proposed a method for expressing governmental administrative codes in a machine-readable graph as well as methods for improving the quality of public

data. Administrative codes are widely used in government information systems, and public data disclosed by the government contain a significant number of administrative codes. Public data contains these codes; however, most datasets remain obscure due to use of abbreviations without sufficient metadata. Data users find it difficult to identify these values within public datasets, thus reducing the quality of public data and preventing their widespread use. Furthermore, if code added or changed by the institution itself is included in public data, determining the accuracy of the code becomes difficult. If government codes had a standard representation for referencing, this would be the primary tool for interlinking among various public datasets and for improving data quality. Additionally, the effort required by users to clean up the data could be minimized.

In this study, 314 administrative codes established by the Korean government were transformed into a knowledge graph. The proposed ontology model is designed to represent recent information applied in related laws and administrative code systems. The vocabulary of the ontology model is designed to incorporate administrative code into a knowledge graph and is extensively repurposed. For example, code sets and codes are defined by extending classes from schema.org. According to the evaluation, approximately 20% of all columns used administrative codes. When it comes to the quality of public data, accuracy tends to be lower than completeness. Although the completeness index was close to 1 in the evaluation results, the accuracy was relatively low at 0.62. Two reasons for this can be identified: (1) the code value is either incomplete or expressed as a string rather than a code; (2) the agency is using the administrative code by itself, either expanding or changing it. In particular, there is a considerable amount of research on diagnosing data quality, but there is a limit to how to refine and improve the actual data. This study diagnoses data quality and improves it by applying the constructed knowledge graph. After applying the value defined in the knowledge graph, the accuracy improved to 0.88. On the other hand, the knowledge graph can be applied to semantically connect disparate datasets. In the five datasets, administrative codes such as AC136 are used only for D<sub>3</sub>, whereas A67 was used with ten columns in three datasets. Thus, A67 can serve as a reference between different datasets, i.e., it can be interpreted that public data containing government codes share an identifier that can be linked to each other. The connections between datasets will increase as the scope of public data is expanded. The established knowledge graph structurally expresses the

administrative codes with the latest information in the administrative code system and semantically defines the relationships among them.

As public data becomes more open and various data can be linked to each other, it is critically important to provide accurate data. Various codes or classification systems established by government legislation are widely used in public data. Therefore, it is necessary to represent the data included in the public data accurately. In particular, data from the public sector are in high demand by governments, companies, and individual citizens. This means that public data can be linked to various data sources in the future. Future research must study public data to include government codes and link them to the created knowledge graph. To do this, the columns contained in the open data must be examined and matched to government codes. In contrast, in addition to the officially used government codes, there are classification systems used as standards by national organizations or private businesses; therefore, it is vital to assess the inclusion of classification systems in public data. Specifically, this task is not a one-time activity, but involves public and private cooperation, and it is desirable to discuss the vocabulary design of the knowledge graph and standards for data interlinking together.

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## CONFLICTS OF INTEREST

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

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# Virtual Internship Experiences of Library and Information Science Students During the Pandemic

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## ABSTRACT

This study aimed to discover the notable experiences of Library and Information Science students in a virtual internship program. It employed qualitative descriptive research design by thematically analyzing the monthly internship journal of the interns. Using Colaizzi's method to identify themes from their experiences, the study revealed that interns expected to gain knowledge and skills on operations, services, and new information communication technologies in libraries. Orientation was found helpful in identifying the things interns needed to prepare. The interns faced issues from procrastination and technical difficulties, which they coped with employing avoidance strategies. Overall, the internship was viewed as an opportunity to learn and navigate the online digital system of the library despite the coronavirus disease 2019 pandemic. They realized their capacity and reflected on which competencies need improvement. In conclusion, students still learned the necessary knowledge and skills of a librarian; experienced the challenges faced in an actual library and were provided with various opportunities and realizations regarding the practice of librarianship. This study proposed a three-stage framework that outlines the involvement of the supervising instructors, librarians, and interns in the internship program from the preparation to the process and post-assessment.

**Keywords:** library schools, in-service training, library science, models, educational

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## 1. INTRODUCTION

Internship is an important aspect of professional education. It enables students to get exposure with professionals, to experience their day-to-day activities, and to encounter the challenges faced in an institutional environment (Bird et al., 2015). Especially in the field of librarianship, it is a professional learning experience that takes place in an actual library for aspiring students to undergo various tasks involving library operations (Malik & Ameen, 2010). In fact, the development of the profession traces its origin to internships, apprenticeships, and in-service training in great libraries (Mukherjee, 1966). As added by Dotson and Doston-Blake (2015), internships are clinical experiences intended for students to bridge theoretical foundations of librarianship into practical application. Bird et al. (2015) argue that internships provide a professionally guided experience compared to any other experiential learning activities for students. Besides experiencing the professional world, students are able to reflect with deeper learning than a course-based assignment could ever grant. Malik and Ameen (2010) used the terms practicum, internship, apprenticeship, and field work to refer to these field-based activities where students engage in professional learning experience under supervision of a professional librarian. Searing and Walter (2012) also used the term field experience to cover any work experience in a library that occurs because of one's status as a Library and Information Science (LIS) student.

In Benguet State University (BSU) in La Trinidad, Benguet, Philippines, the internship is a required subject to be taken by students enrolled in the LIS program to fully immerse themselves in learning the professional practice of the theories they have learned in their previous coursework. Commission on Higher Education Memorandum Order No. 24, Series of 2015 sets the highest level of quality desired for the education and training of library and information professionals. The program was designed to provide students with on-the-job experience in academic, government, school, and special library environments. Based from the syllabus and course description, the practicum equips students for the demands of the shifting paradigm of library service by strengthening and supplementing the theoretical knowledge gained in the classroom in a real work setting. It also prepares students for the modern and automated delivery of information services through completing actual activities in the different aspects of library service. During the pandemic, internships could only be done virtually; that is why the supervising instruc-

tor, librarians, and especially students, adopted changes to adjust to the online internship set-up.

The shift in the conduct of internships from a physical to online set-up was one of the effects of the coronavirus disease 2019 (COVID-19) pandemic. The pandemic had a great impact not only on internships but on the whole aspect of education and training (Bugis, 2021). It brought the education sector to go through necessary changes for students, teachers, and educational institutes to abide by government guidelines and protocols (Dani et al., 2020). The adaptation of virtual or online internships became the common strategy used by various learning institutions in training students from the medical, education, business, hospitality and tourism, and information communication technology (ICT) fields (Bilsland et al., 2020; Bugis, 2021; Dani et al., 2020; He et al., 2021; Theelen et al., 2020; Yıldırım et al., 2021).

Virtual internship is not a novel idea. In fact, many institutions have already been offering online LIS programs and virtual internships have been well established (Juarez & Blackwood, 2022). However, both the teaching department and the library department of BSU is new to this kind of internship. This paper will describe the experiences of LIS interns during the pandemic and identify the advantages and disadvantages of the virtual internship program.

## 2. LITERATURE REVIEW

Iradel et al. (2021) revealed several themes that described the lived experiences of pre-service teachers during their internship. The first of the themes showed that interns set their expectations towards their internship. According to Hruska et al. (2022), it is important for virtual interns to have a clearly defined expectation towards the internship program. That is why internship satisfaction studies include expectations as integral to revealing interns' experiences (Vo et al., 2022). As added by Cannon and Arnold (1998), as cited by Păceșilă and Popescu (2022), employers and academics believe it is important to understand students' expectations towards internships. These expectations reveal what students hope to experience and their intention to be able to identify things needed to be arranged or prepared for their internship. Iradel et al. (2021) discussed a theme where students were able to receive support from various sources ranging from financial, moral, and emotional support. In this part of their study, it revealed various arrangements made by students before the internship, especially its online mode. Hruska

et al. (2022) recommended establishment of a virtual work environment resulting in productivity and collaboration among interns. The online internship required vast adjustments for students and educators, so determining the preparations made would provide better understanding of online internship experiences during the pandemic. In fact, the preparedness of both the mentors and interns are factors in achieving internship goals, especially when it is conducted remotely (Wickramasinghe & Jayawardane, 2022).

With these drastic changes and preparations needed, virtual internships are not immune to challenges. Iradel et al. (2021) discussed the roadblocks faced by interns during the online internship as a part of the whole internship experience. Paired with these challenges were the coping strategies employed by interns to survive and succeed with their internship. Quinco-Cadosales (2022) inquired of virtual interns how they coped with the challenges of an online teaching internship. Iradel et al. (2021) revealed how these challenges affected the interns, and they were mostly attributed to the COVID-19 pandemic. It is interesting to also document these challenges to know if it would differ in the context of a developing country. As concluded by Aucejo et al. (2020), less advantaged students felt more negative economic and health impacts during the online mode of classes.

However, studies did not only focus on the negatives, as there were also opportunities that the virtual internship offered. Iradel et al. (2021), on one of the themes of internship experience, revealed that interns considered the virtual internship as an opportunity for skill development, acquisition, and self-improvement. According to Kernan and Basch (2022), students benefited from virtual internship by enabling them to learn and practice skills related to communication with technology, conveniently and with lesser cost. Wickramasinghe and Jayawardane (2022) also revealed that remote internship provides exposure to network and employment opportunities to interns.

Lastly, the whole internship experience can be concluded by the learning and reflections that the interns gained after the immersion. Iradel et al. (2021) dedicated three themes in which interns were able to express what they learned throughout their internship. Specifically, interns exhibited cognitive-social-teaching presence, developed growth mindset, resilience, integrity, and tenacity (GRIT), and were also able to reflect on their online internship experience.

## 2.1. The Library Practicum in Benguet State University

The library practicum is the final part of the library science education program where students transition from being a student to becoming a librarian. Quijano (2015) previously identified five professional competencies in which the tasks of interns were categorized, namely; (1) cataloging and classification, (2) reference and information work, (3) indexing and abstracting, (4) information technology, and (5) others. For this internship, the assigned tasks added organization and management, and selection and acquisition, to align with the subject areas covered in the exam. In traditional face-to-face internship, all tasks are performed in actual. The interns report to the library and are stationed in various sections of the library to provide reference and circulation services. They are also routinely rotated for them to experience all sorts of library work, including technical work, managerial work, and appraisal functions. Fortunately during the pandemic, most libraries were able to migrate their services online and initiated virtual counter part for all of their services. This made virtual internships for LIS student feasible. Interns could still achieve learning outcomes by performing digital library workloads remotely.

## 2.2. Internship Model

This study took inspiration from the internship models of Sweitzer and King (2019), Kiser (2015), Woodside (2017), and Quijano (2015) that described the stages of internship. The developmental stage of internship of Sweitzer and King (2019) included interns' expectations and preparations in the anticipation stage up until their reflections in the culmination stage. Kiser (2015) emphasized the bridge between these two stages and dubbed it as the working stage where the bulk of internship work occurs. It is also where most of the issues and challenges arise that interns are expected to handle. Quijano (2015) emphasized the latter stage of internship where reflection bridges experiences into meaningful understanding of the profession. These models highlight the importance of preparation, continuous feedback, new skills and knowledge development, and networking. Additionally, virtual internships may require additional steps such as ensuring that the intern has access to the necessary technology and software, setting up virtual communication tools, and clarifying expectations for remote work. Apart from the stages, the involved parties in the internship could also be included in developing a framework to illustrate the interaction between the instructor, the librarians, and the interns, as exemplified by the model of Bird and Crumpton (2014).

### 3. RESEARCH OBJECTIVES

This study aimed to discover the notable experiences of LIS students in their virtual library internship program as extracted from their reflections. Specifically, the study aimed to answer the following questions:

RQ1. What were the interns' expectations towards their virtual internship?

RQ2. What were the preparations made by the interns for their virtual internship?

RQ3. What were the challenges faced by virtual interns?

RQ4. What were the coping strategies employed by the interns?

RQ5. What were the opportunities available for the interns during their virtual internship?

RQ6. What were the realizations of the interns after their internship?

RQ7. What would be the suitable internship model/framework for BSU LIS students in the new normal?

### 4. METHODS

The research utilized a qualitative descriptive design and employed diary analysis of the students' internship journals. These journals were monthly entries that documented their accomplishments and insights regarding their internship, with specific prompts for each month centered on their expectations, preparations, challenges, coping mechanisms, opportunities, and realizations. The entries were collected through Google forms and consolidated, analyzed, and coded using Collaizi's thematic analysis to identify prominent themes. To begin the analysis, the journal entries of each participant were combined into a single file for each student, resulting in a comprehensive collection of data. Each transcript was then carefully read and reread to gain an overall understanding of its contents. Significant statements that pertained to the phenomenon under study were then highlighted and recorded on a separate sheet, along with the corresponding code for the student. From these significant statements, meanings were formulated and categorized into subcategories. The findings of the study were then synthesized into an exhaustive description of the phenomenon under study, which in this case is the students' internship experience. The fundamental structure of the phenomenon was then described. Finally, to ensure the accuracy of the results, the research participants were consulted via follow-up interviews

via chat, email, or messaging to validate the researcher's descriptive findings against their own experiences. The study covered a virtual internship that ran from August to December 2021, followed by a partially virtual internship from January to May 2022, where the 35 students reported physically and performed a mix of virtual tasks.

### 5. RESULTS

The findings present the percentage of students who expressed the following responses pertaining to their expectations, preparations, challenges, coping strategies, opportunities, and realizations. The responses were extracted and examined from journal entries as shown in the appendix. The tables present statements according to what was experienced by students the most.

#### 5.1. Expectations

Table 1 shows that interns were mostly expecting to gain knowledge and skills on library operations and organization. This includes interns expressing their hopes on learning about the roles and responsibilities of librarians and how are they being translated into practice. They expect to learn the roles of a librarian, the new technologies (e.g., online public access catalog, databases, systems), and new knowledge on the different actual library operations. The interns were already familiar with the library staff, its services, and procedures because they have experienced the library services before. However, because both the internship and the library services went online during the pandemic, interns still expected an orientation or introduction of library services and procedures before starting their tasks. They still needed instructions and briefing on the house rules, policies, and outputs expected from them as interns and not as library users.

The interns also hoped that their co-interns will be helpful, cooperative, and supportive. However, most of them were anxious about the responsiveness and availability of their co-interns during online meetings due to expected delayed communication. Still, some interns were optimistic towards their co-interns hoping they contribute and help everyone patiently, because not everybody knows what to do. The interns hoped for a positive relationship from their co-interns despite the anticipated difficulty in connecting with each other virtually.

The interns were also optimistic about learning from the university library. Results show that 69% of the interns were sure that they could learn a great deal from the university library, whether their internship will be online

**Table 1.** Library interns’ expectations (n=35)

RQ1: What were the interns’ expectation towards their virtual internship?	n (%)
I expect to gain knowledge and skills on the operation, services, organization, roles and responsibilities of librarians and new information communication technologies.	28 (80)
I am hoping that my co-interns will be helpful, cooperative, and supportive.	27 (77)
I know I can learn a lot from our university library regardless if it will be online or face-to-face.	24 (69)
I am hoping that the internship will be done face-to-face.	23 (66)
I am hoping that our teacher and supervisors will teach and guide us to accomplish our tasks.	16 (46)
I am expecting that the tasks will be challenging.	15 (43)
I expect that our supervisor will provide constructive feedback and other helpful resources that will help us improve our tasks and accomplishment.	13 (37)
I am looking forward to experiencing the actual or and hands-on tasks of a librarian even on an online or physical set-up.	13 (37)
I am expecting that our supervisor will be approachable and responsive to our online queries.	11 (31)
I am expecting to be well-oriented and introduced to the library before starting our tasks.	10 (29)

or face-to-face. One of the reasons cited by the interns includes the geographical accessibility of the library. Because 66% of them also hoped for a face-to-face internship, they also expected that they could easily visit the library physically whenever they need guidance about their tasks. The interns also expressed confidence in the library staff’s competence in training them. The recognition of the library as an outstanding academic/research library was also cited as to why interns were certain they can learn from the library. The interns’ familiarity with the library makes them confident and at ease with their internship. This means that the institution’s recognition and familiarity to the interns affects how students project expectations towards their internship.

Interns also hoped that supervisors would be approachable and responsive when they ask for assistance and guidance from the librarians. Interns were expecting to learn but not from the librarians alone. They were not expecting people to be helping them, because they should learn to do thing on their own. Even if they expected to be guided by supervising librarians and be supported by their co-interns, they knew they had to rely on themselves and not on others. The interns knew it would be challenging to undergo their internship virtually because they had a hard time coping with virtual classes. They associated the challenges of online classes with not being able to experience actual classroom activities. This might also explain why some interns were looking forward to experiencing the actual or hands-on tasks of a librarian even on an online set-up which they were not able to fully experience in

their online classes.

Overall, the interns expected to gain knowledge on library operations and organization while building a positive relationship with their co-interns and receive guidance from supervising librarians. The competence of the librarians and the recognition of the library added optimistic expectations to the interns, reassuring great learning experience from hands-on tasks. Meeting these expectations is crucial for a successful internship experience.

## 5.2. Preparations

Table 2 shows that 97% of the students were properly oriented with the policies, procedures, rules, services, and staff of the library. They were given instructions and details about the expected outputs and tasks that they shall accomplish in their internship. The interns considered proper orientation as their foremost integration into the library as part of the library workforce, even if temporary. The orientation introduced the tasks they will be doing virtually, therefore giving them an idea what resources, equipment, skills, and knowledge they should have to fully participate in the internship activities. There were also interns who took the initiative and browsed the library’s website beforehand to be familiar with the library.

However, the interns admitted that they were not initially prepared for the internship. Only 34% of the interns had enough online and print resources that would help them study during the online practicum. The interns identified their Google accounts, Microsoft software, e-books, previous notes and handouts from other course

**Table 2.** Library interns' preparations (n=35)

RQ2: What were the preparations made by the interns for their virtual internship?	n (%)
I was properly oriented with the policies, procedures, rules, services, and staff of the library, and was given instructions and details about the expected outputs and tasks that we shall accomplish in our internship.	34 (97)
I have enough online and print resources that will help me study during the online practicum.	12 (34)
I have planned a strategy to handle the tasks and workload that would be assigned to us for the library.	11 (31)
I have a support system (family, friends, relatives, etc.) that will help me face the internship.	10 (29)
I am on the right emotional or mental capacity that will help me survive the challenges I will face during the internship.	9 (26)
I am physically prepared for the online internship, or even for a face-to-face internship.	9 (26)
I have the required electronic and digital devices for online internship.	7 (20)
I have the necessary knowledge skills regarding library services, information and communication technologies and others that will help me accomplish tasks.	6 (17)
I have a stable internet connection for my online internship.	4 (11)
I have a sufficient financial capacity that will support my internship.	2 (6)

work, as their supplementary learning resources to review basic librarianship concepts. Furthermore, only 31% of the interns said they have a planned strategy to employ to handle the tasks and workloads assigned to them. Some of them planned changes with their daily schedule and developed good study/work habits while some eyed multi-tasking and working with their classmates on the expected outputs.

In terms of their physical and emotional preparedness, only 26% of the interns expressed that they had the right physical and mental capacity to attend a virtual internship. Interns based their physical preparedness on their proximity to the library. Some interns rented boarding houses or stayed with relatives living near the school campus. Those who were staying in faraway residences had to find a place with a stable internet connection. Other interns were also anticipating restrictions to be lifted sooner so they would be ready to visit and do library work. Even if most interns knew it would not be possible for face-to-face internship, only a few interns claimed to be emotionally and mentally prepared for the online internship.

But despite online classes were being in place for a year already, interns were not yet prepared with a stable internet connection. Only a few interns were able to subscribe to internet plans to make sure they have a stable internet connection. The rest relied on mobile data and Wi-Fi hotspots to have access to the internet. Those with internet plans still need to secure extra budget to buy data in case their internet subscription fails. Additionally, only a few students had a prepared set of electronic devices to

attend virtual classes and their internship. Some of them had to buy their own or borrow from their siblings, who were also using those laptops for work or school. Not all interns could afford these because only 6% had sufficient financial capacity to support their internship.

The findings revealed that only a few interns were initially prepared and had the right physical and mental capacity to attend a virtual internship. Fortunately, the majority of the interns had a proper orientation which they considered as their foremost integration into the library workforce. These findings suggest the need for better preparation and support for students and interns in the virtual setting, including providing more resources and guidance for online learning and improving access to stable internet and electronic devices.

### 5.3. Challenges

Table 3 shows that 40% of the interns faced personal issues and matters regarding their study habits. There were numerous distractions that pulled their interest and attention once they log in online. That is why 31% of the interns also experienced issues with procrastination and time management. They admitted procrastinating on most of the tasks, causing their schedules to get filled up with other personal priorities. Managing their time is the real challenge for them in this internship because people at home assume that online learning is easy; they were always sent to do errands. They also struggled with managing their time in dealing with requirements for other subjects they are enrolled in. That is the reason why 40%

**Table 3.** Library interns’ challenges (n=35)

RQ3: What were the challenges faced by virtual interns?	n (%)
I faced personal issues and matters regarding my study habit.	14 (40)
I had experienced difficulty in balancing schoolworks and household responsibilities, making it difficult to concentrate with studying and doing the tasks assigned to me.	14 (40)
I had trouble accessing the online platforms and websites of the library due to my internet connection.	13 (37)
I had a hard time finishing the tasks due to system/server issues or power interruption which were out of my control.	13 (37)
I had encountered problems with time management and procrastination.	11 (31)
I have experienced stress, anxiety, depression, and burnout in managing the tasks and activities I have to accomplish.	10 (29)
I had troubles in accessing the online platforms and websites of the library due to incompatible and outdate electronic devices.	8 (23)
I had a hard time understanding and following the instructions, rules, policies, procedures, and guidelines of the library.	8 (23)
I have dealt some problems working with my co-interns in terms of responsiveness and cooperation.	5 (14)
I have experienced health and medical issues during the internship that got in the way of accomplishing the tasks.	3 (9)

of them expressed that they had trouble balancing school-work and household responsibilities, making it difficult to concentrate on studying and doing the tasks assigned to them. Some needed to tend to their younger siblings left with them at home, or take care of their grandparents that needed assistance from time to time. They also added that these were not issues during face-to-face learning where it was easier to focus.

Because all their tasks were done electronically online, they were affected by server shutdowns and other technical difficulties. Interns had trouble accessing the online platforms and websites of the library due to slow internet connections. The interns complained about connectivity issues affecting their participation in meetings and group discussions. Some would even struggle with following instructions during lectures that are being interrupted by fluctuating signals. Troubles accessing the online platforms and websites of the library were also due to incompatible and outdated electronic devices. There were also instances where students experienced power interruptions and system issues that impeded their accomplishment of their tasks. Interns experiencing this felt helpless because there was nothing they could do but to wait.

Technical problems were not the only challenge faced by the interns because 29% of the interns experienced stress, anxiety, depression, and burnout in managing the tasks and activities. They attributed this stress to the delayed workload caused by procrastination as well as the server/system maintenance that halted their technical

and cataloging work. The health and medical issues faced by the interns were also notable. There were interns with households infected by the virus, which also affected their day-to-day activities, preventing them from going out and getting essentials.

These findings show that a significant percentage of interns faced personal issues and difficulties with managing their time and procrastination. The interns also had challenges with technical difficulties, slow internet connections, outdated electronic devices, and power interruptions. In addition, some interns experienced stress, anxiety, depression, and burnout while managing the tasks and activities. Communication and responsiveness among co-interns were also problematic due to poor internet connections, causing delayed receipt of messages and instructions. The health and medical issues faced by some interns due to the pandemic were also notable. In conclusion, the virtual setting of internships presents unique challenges that must be addressed to provide better learning experience for students and interns, including providing more resources needed to deal with the challenges and problems in a virtual internship.

#### 5.4. Coping Strategies

Table 4 shows that 34% of the interns preferred taking a break from schoolwork and household chores. Some of them went home to their province to “enjoy natural life” and “have some fresh air.” Some played games to relieve stress. Some interns found relief from listening to music

**Table 4.** Library interns' coping strategies (n=35)

RQ4: What were the coping strategies employed by the interns?	n (%)
Taking a break to relax by going on a vacation, playing online games, listening to music, reading, gardening, forest bathing, or other activities outside school, work, and household chores.	12 (34)
Asking for assistance on difficult tasks helped me overcome the problems I have encountered.	10 (29)
Managing my time helped me balance my tasks and be able to accomplish them before the deadline.	10 (29)
Keeping myself busy and productive helped me focus on the positive side of things.	10 (29)
Setting up a plan and strategy in handling the activities helped me organize which should be prioritized.	8 (23)
Diverting my attention to other important things helped me cope with the problematic situations.	8 (23)
I was able to depend on my support system to relieve from the stress, anxiety, and depression I encountered during my internship.	8 (23)
Doing physical activities such as exercising, reorganizing my study area, eating, hiking, or going to part time jobs helped me relieve the responsibilities of school, and household chores.	7 (20)
Keeping myself motivated through reminding myself of my sacrifices and of people around me and the awaited culmination of my college journey.	3 (9)
Doing spiritual and religious activities helped me find comfort and relaxation during breakdowns or burnouts.	2 (6)

and reading fantasy or fiction books to escape their stressful reality. For some, they found gardening in particular as something therapeutic. Besides doing nothing or doing something aside from the required tasks, interns also diverted their attention to several physical activities such as exercising, reorganizing their study area, eating, hiking, or going to part time jobs to help them relieve from school and household responsibilities. Interns also claimed that eating helped them reduce stress. Some were also able to cope with the situation by keeping themselves active physically, such as bicycling, because it relieves stress.

There were also coping strategies where students faced challenges or problems head on. There were 29% of the interns who stated that they asked for assistance or help on difficult tasks to overcome or alleviate the problem they encountered. Some interns recalled how they were seeking help and guidance from co-interns, supervisors, librarians, and other teachers in handling problems with their internship. Some of them remembered how their co-interns were the ones providing updates on the activities they forgot to do or to finish. Similarly, 29% of interns worked on their individual problems by simply managing and reorganizing their schedule. They allotted a day or time per activity so they could eventually finish their tasks. They cleared out their schedule by accomplishing one task at a time, instead of trying to accomplish multiple things in one time. Another strategy was to identify first the importance or urgency of the task then identify among pending tasks which should be prioritized.

It was also found that very few students were able to maximize spiritual activities and self-motivation as a coping strategy. One of the interns said that "prayer helps in all kinds of situations." Some interns also found a way to motivate themselves and to wake their senses whenever they were feeling nervous or losing enthusiasm in starting tasks. Some relied on self-motivation to continue studying and eventually finish the degree.

The study found that interns have different coping strategies to deal with stress during their internship. Most of the interns preferred taking a break or diverting their attention, while some preferred seeking help, or doing spiritual and motivating activities. Overall, there were various coping strategies that interns used to manage stress during their internship. It is important for interns to identify which coping strategies work best for them and integrate these strategies into their daily routine to promote well-being and productivity. Employers and educational institutions can also provide support and resources to help interns cope with stress and promote a positive internship experience.

### 5.5. Opportunities

Table 5 shows that 63% of the students were able to have a chance to learn and experience actual digital library work despite their internship being online. This is because they were given access to the library management system. They were given access to the software used in cataloging and book listing, which allowed them to experience

**Table 5.** Library interns’ opportunities (n=35)

RQ5: What were the opportunities available for the interns during their virtual internship?	n (%)
It was a privilege to be able to learn and experience actual digital library works.	22 (63)
It was a learning opportunity to improve my time management, organization skills, and quality of my works and outputs.	20 (57)
It was a learning opportunity to increase my ICT skills especially using computers, software, websites, and databases.	18 (51)
I was able to explore and navigate the library portal remotely and learn how to work with Library Management Systems online.	18 (51)
I became a part of the library staff who provides library and information services to clients even though it was conducted online.	10 (29)
I had a chance to study at the comfort of our home with our family.	9 (26)
I was also able to help do chores at home or help in family business while finishing my studies.	7 (20)
I had an opportunity to gain extra income by applying for a part time job while studying.	6 (17)
I had an opportunity to start new hobby, passion, or leisure activity due to the flexibility of the learning set-up.	4 (11)
The remote learning set-up saved transport expenses, accommodation expenses like boarding house and dormitories, and other expenses usually needed during face-to-face classes.	3 (9)

technical tasks at their homes. Interns also considered it an opportunity to gain access to the library system to learn Machine Readable Cataloging tagging, which they were not able to learn because of the pandemic. That is why 51% of the interns considered it an opportunity to be able to explore and navigate the library portal remotely and learn how to work with library management software (LMS) online. It was also a chance to increase their ICT skills, especially using computers, software, websites, and databases. Because of the activities involving the system, their cataloging skills improved. Some of them attested that had it not been conducted online, they would not become experts in using computers at this time.

More than half of the interns stated that their internship was a learning opportunity for them to improve various skills and competencies, such as time management, and organization skills which resulted in improving the quality of their work. Besides the opportunity to experience remote working tools and technologies, they were also able to enhance their time management and communication skills during the internship. Some of the interns stated that time management skills were tested and refined due to the challenges in keeping their schedule balanced. They also said that the activities were able to enhance their technical skills a little bit better.

It is also notable that interns were able to help in household chores, do part-time jobs, start new hobbies, and save expenses despite a small percentage of interns acknowledged these opportunities. Some of them were

very positive that they were able to help with household chores or their family business while attending online classes. Some interns were thankful that they were able to apply for a part time job and help with their expenses and school requirements. Aside from earning opportunities, online internships saved money and time, unlike traditional internships where students had to commute to physically report. It also lessened their usual expenses because instead of renting boarding houses, they could stay at home and do their schooling. Some of them also found time to indulge in new hobbies because of the online set-up.

The study found that despite the internship being conducted online, most of the interns were still able to learn and experience actual digital library work through their access to the library management system and software used in cataloging and book listing. The online format also provided an opportunity for interns to increase their ICT skills and learn how to work with the LMS remotely. Additionally, the internship was found to be a valuable learning experience for the students to improve their time management and organization skills, as well as their technical and communication skills.

The online format of the internship provided some unexpected benefits, such as the ability to help with household chores or family businesses, apply for part-time jobs, and explore new hobbies. Furthermore, it saved resources for the interns by eliminating the need for commuting and accommodation expenses. Overall, the study found

that online internships could provide valuable learning opportunities and benefits for students, even during the pandemic.

### 5.6. Realizations

Table 6 shows that a majority of the students became more self-aware when it comes to their capabilities and limitations. There were 74% of the interns who realized what they can and cannot do. The students realized which aspect of their skills and knowledge needs enhancement and improvement. They admitted they needed to improve their time management and to lessen their time spent on unimportant things, such as social media. They realized that they also needed to become more confident with their skills. Some interns also admitted that they needed to work on their communication skills and cooperation with other interns. Some of them also recognized their lack of knowledge on the theories they did not encounter and skills they were not able to practice in their online classes.

Nearly half of the interns have also realized how hard and important a librarian's job is. They were able to witness librarians' actual challenges and at the same time the significant contribution of librarians to the community they serve. The interns' exposure to actual library work led interns to realize how difficult it is to work as a librarian, especially on an online set-up. Some realized that they needed to multitask and be patient in performing their tasks and functions as librarians in the future. At the same time, they were able to realize that there is a large quantity

of knowledge and skills that a librarian must have. They have learned that a librarian must possess knowledge and skills in different fields on information resources and technologies, to efficiently provide the information services needed by clients. Some of them realized that there are many things they have not learned or known yet, and that they must exert effort to learn about those things.

Another reason why interns realized how hard library work is, is because they witnessed the difference of theories and principles as compared with actual and practical applications. Among the interns, 43% realized the difference between theories and principles compared to the actual and practical application of library and information concepts. They were able to compare and see what is ideal and what is being done in reality; and that it is more complicated. They came to understand that the real duties of librarians vastly differed from the way they were being taught in the classroom.

Many of the students realized their capabilities and limitations, including the need to improve their time management, communication skills, and technical knowledge. Additionally, nearly half of the interns acknowledged the challenging nature of a librarian's job and the importance of possessing a diverse set of skills in different fields of information resources and technologies. Furthermore, the interns' exposure to actual work challenges and the difference between theories and practical applications in the library setting contributed to their realization of the complexity and difficulty of library work. These show that online internships can help students gain a better under-

**Table 6.** Library interns' realizations (n=35)

Q6: What were the realizations of the interns after their internship?	n (%)
I learned to become more self-aware when it comes to my capabilities and limitations.	26 (74)
I realized how hard and important a librarian's job really is.	17 (49)
I have realized the difference with the theories and principles compared to the actual and practical application of library and information concepts.	15 (43)
I have realized that there are a lot of knowledge and skills that a librarian has to have to be able to function efficiently in the library.	14 (40)
I have realized the importance of working with others in the attainment of one goal.	12 (34)
I have learned the importance of paying attention to every detail during instructions to be able to work efficiently.	12 (34)
I have realized the importance of doing hands-on activities in our learning and educational development.	11 (31)
I learned the importance of seeking help, guidance or assistance from supervisors and co-interns.	10 (29)
I learned how to organize and plan my work and managing my time in handling multiple tasks.	7 (20)
I have learned how to work effectively under pressure despite dealing with personal, financial, emotional, mental, family, school, or work problems.	2 (6)

standing of the profession and the skills required for practice.

## 6. DISCUSSIONS

### 6.1. Expectations

Most of the students expected to gain knowledge and skills on the operation, services, organization, roles, and responsibilities of librarians, and new ICTs. They also had high expectations on the cooperation and support that their fellow interns would give them during their internship. It is important for interns to express their expectations for them to have a basis for determining their success after the internship. The more accurate their perception or expectation towards the organization, the more successful they may become in their internship (Knouse & Fontenot, 2008). According to Basow and Byrne (1992), supervisors may help interns learn what to expect from their internship through sharing reports from previous interns. The orientations can also provide details for students to formulate their expectations towards their internship. Knouse and Fontenot (2008) also added that internships help interns create a set of realistic expectations for work. On the other hand, Ruhanen et al. (2013) also emphasized that clear articulation of expectations to students mitigates the negative consequences of less structured programs. This means that both expectations of students and supervisors should be discussed to help define the internship.

Interns, when faced with uncertainties and profound expectations confronting the expected internship, do have varied assumptions on how it will proceed, especially when restrictions are still part of the equation. The high expectation goes well with what they have seen, heard, or even experienced from previous small exposures aligned to their academic courses. It can also be due to the rigid orientation as to what is expected of them as interns; also, to a certain level, because BSU Library and Information Services is one of the more excellent research and academic libraries. Its awards were also cited by the interns as one of the reasons why they were delighted to be deployed at the library. Similarly, Yoo and Pang (2007) found among culinary arts interns' expectations that the social image of the hotels provided a major contribution to the internship expectation.

### 6.2. Preparations

A majority of the students were not prepared mentally and physically. They admitted they were still hoping for a face-to-face internship since not all of them have

the capacity for an online internship such as an internet connection, computers, and devices. They also admitted to having a lack of online and print resources as well as the necessary knowledge and skills regarding library internship. They also lack emotional stability, support, and financial capacity that would help them survive their virtual internship. A study revealed that, especially during the pandemic, many students suffered from high levels of anxiety, depression, and distress (Essadek & Rabeyron, 2020). University students, which includes interns on their final course requirement, are vulnerable to various mental health concerns (Kaparounaki et al., 2020). Thakur (2020) stated that the quarantines, trauma, grief during COVID-19, and the lack of adequate support systems further increased the risk of mental health problems among adolescents.

However, the unpreparedness among interns was compensated for by the preparations they made because of the orientation. The interns regarded the internship orientation as a way for them to be prepared for the whole internship. As recommended by Park and Jones (2021), there should be orientations for internship that include working conditions and expectations for virtual internships. This goes back to the goal of internship orientations in preparing students for what to expect and not to expect. Supervisors must help their interns state their learning goals for them to realize what they must contribute and what they would like to learn in return (Basow & Byrne, 1992). Interns' uncertainty regarding virtual internship should be clarified during internship orientation. This allows interns to have a clear picture of the organization they shall be working with, which is a predictor of their success for the internship (Knouse & Fontenot, 2008).

Virtual internship as part of a career program requires increased planning and consideration by both interns and supervisors, but they can still be a great way to gain skills and make connections. Being unprepared is a struggle, especially for unexpected virtual internship programs. This might be coupled with the feeling of incompetence and the false hope of having hands-on internships.

### 6.3. Challenges

The interns dealt with personal issues, especially regarding their study habits. Some experience being easily distracted and eventually procrastinating and struggling to manage their time. Interns also have trouble in balancing schools work and household responsibilities. Although these individual and personal issues would still be present in traditional internships (Ruggiero & Boehm, 2016), the

interns attributed these personal issues to the distractions they encounter online. Kostaki and Karayianni (2022) also discovered that during online and distance learning, students generally find it difficult to concentrate due to cellphones, social media, and all-day screen time. Hollis and Was (2016) also discovered that mind wandering, and social media distractions affect students' performance in online learning.

Other problems faced by interns were due to technical and technological issues, such as poor internet connections, server shutdowns, incompatible electronic devices, and power interruptions. The interns claim that these technical and technological issues impeded them from finishing their outputs properly and affected the quality of their work. These were also the same issues revealed by Kostaki and Karayianni (2022), that students dealing with a slow internet connection and disruptions on the communication platform causes them trouble in hearing their teacher. The same applied for the interns, where technical issues caused communication failure, especially in meetings where task instructions were given by their supervisors. Besides their instructors and supervisors, interns also experienced difficulty in working with others due to poor internet connections. Chen et al. (2020) confirms that technological difficulties impede development of group relationships and interaction with each other. In other words, technical difficulties hindered students' learning and participation in the tasks and activities (Kostaki & Karayianni, 2022). The internship needs to emphasize collaboration and cooperation among students, not competition, focusing on what can be achieved through collaborative learning and achievement. Maintaining smooth communication supports collaborative learning and achievement, especially in virtual internships.

Consequently, these technical problems are also causing stress, anxiety, depression, and burnout in managing the tasks and activities. Although students admitted procrastinating and delaying their work, their stress is aggravated by the slow signal whenever instructions and demonstrations were given during virtual meetings. This affects their reception of instructions, rules, policies, procedures, and guidelines of the library. The continuous logging on and off due to internet connection issues can pose serious issues that make interns unable to understand and communicate well (Chen et al., 2020). But on the brighter side, very few students dealt with medical problems related to COVID-19 because of the strict implementation of lockdowns. Because of the virtual internship, the interns did not need to go out, which might possibly result in get-

ting infected. However, Kostaki and Karayianni (2022) reported that students' eye health was affected because of staring at their screens for too many hours. Fortunately, no students reported such challenges and other ergonomic issues.

#### 6.4. Coping Strategies

The interns employed numerous strategies to cope with challenges during the internship. Most of the interns preferred taking a break by doing activities outside school, work, and household chores. These strategies were categorized by Ismail et al. (2020) as avoidance strategies to cope with challenges encountered. These were found to be moderately correlated with stress, anxiety, and depression. These active self-distractions or diversion of tasks were also categorized as avoidance coping strategies. The results show that most of the students' strategies fall under avoidance, which is completely opposite with the result of Ismail et al. (2020) that avoidance is the least employed strategy by interns.

There were also interns who preferred dealing with the problems head on by asking for help or managing and reorganizing their schedule. This implies that there were interns who tried to personally adjust and find flexibility in the different activities related to their internship. For interns in the medical field, these problem-focused strategies were the most used and resulted in interns performing better (Ismail et al., 2020). For the case of library interns, problem-focus strategies were second to avoidance strategies.

The least employed strategies were emotion-focused strategies. Some relied on strengthening faith through spiritual activities while some relied on self-motivation through pushing or reminding themselves of what is at stake if they failed to come to their senses. This implies that only a few interns dealt with their problems through working out spiritual or motivational issues.

#### 6.5. Opportunities

The chance to experience digital library work, and navigate library databases and systems despite the pandemic, were considered by the interns as an opportunity. They were privileged to learn and perform the tasks of librarians when services go online. This also provided an opportunity to learn, enhance, and improve their skills in ICT and other library technologies. Similar to the opportunities in virtual teaching internships, interns were also able to explore various technological resources and tools during their internship (Iradel et al., 2021). The interns

were also able to maximize their access to the library system because they were also properly guided on how to use and navigate the database. According to Park and Jones (2021), the proficiency of the supervisors was deemed by interns as an important competency to supervise virtual internships. This means that supervisors must be technology savvy to better guide interns in using the system that the library uses. That is also why many of the interns in this study attested that they were guided and assisted in the totality of library operations. The provided access to the actual database used by the library was highly appreciated by the interns because it was an opportunity for developing cataloging skills and learning new technological skills. Iradel et al. (2021) also discovered that interns were grateful because virtual internship experiences provided opportunities for skill development and acquisition. The interns also viewed their internship as an opportunity to improve soft skills such as time management, and organization skills that help them in producing better outputs. Gill (2020) also highlighted that one of the key learnings in online internships is time management. These soft skills are also as important as the technical skills for the interns to develop. This can only mean that the virtual internship was still able to provide the necessary learning that traditional internships offer. As explained by Ruggiero and Boehm (2016), virtual internships offer the same benefits as traditional internships such as giving an opportunity to gain experience working in a virtual environment.

The interns were also able to maximize various opportunities during their internship such as helping with household chores, earning extra income from part-time jobs, starting new hobbies, and even lessening their expenses for travel and accommodation. Iradel et al. (2021) confirm these opportunities, stating that online teaching internships provide cost advantages enabling interns to save transportation expenses. Being able to work part-time and earn a salary while studying is also a plus factor for why the interns appreciated virtual internship. These are some of the issues in traditional internship that virtual internship addresses; the need to temporarily relocate to nearer residences, to travel long distances, or to take time off from the current jobs of the interns (Ruggiero & Boehm, 2016). These factors were also revealed by Kostaki and Karayianni (2022), that students have more time to rest and study with the time in commuting lessened in online learning.

## 6.6. Realizations

The virtual internship allowed students to reflect on

themselves and discover their capabilities and limitations. Most specifically, the interns were able to realize their weak competencies needing improvement, such as time management, confidence, communication skills, and their ability to manage their tasks. Similarly, Iradel et al. (2021) also found that teaching interns have the same realization that there should be skills they have to improve, specifically behavioral and emotional self-regulation. Gill (2020) also found that one of the key learnings in students' self-management of their workload is to have self-discipline. This really shows that online internships effectively allow students to reflect on their work and themselves. This is supported by work by Sweitzer and King (2019), which discussed that reflection is a key component of experiential education because it connects the field work to the learning. In fact, the National Society for Experiential Education (2022) identified reflection as an element that transforms simple experience to a learning experience. Sweitzer and King (2019) added that internships and other kinds of field instruction are a form of experiential learning where students can translate their classroom lectures into real workplace scenarios. Interns also realized their lack of technical knowledge and skills in librarianship which they were not able to learn in the classroom. This means that while the interns were lectured with theories and principles in the classroom, there should still be other trainings and orientations to prepare them for the challenges to be dealt with in real workplace scenarios. These were also the same realizations of teaching interns in the study of Iradel et al. (2021), that they think their three-year preparation for the teaching internship was insufficient and must be improved. This realization might also be attributed to the various challenges faced by student interns in their work, outputs, co-interns, and selves, which can only be discussed but not actually experienced inside the classroom.

That is also the reason why interns have learned the difference between theory and practical applications of librarianship. This coincides with the findings of Iradel et al. (2021), that internships provide students with several opportunities to apply what they have learned in class. Internships, indeed, bridge the theories they learn in their classroom into practice. Although a larger percentage of students stated that they were able to experience actual digital library work, not all interns were able to fully connect theory into practice due to the lack of hands-on activities which they will be physically experiencing when accomplishing their tasks in the library. As an effect, only a few students realized the importance of doing hands-on

activities in their learning and development. This might also be the reason why only a few of the interns were able to learn how to work under pressure and deal with the challenges experienced in the workplace. The lack of hands-on activities made the internship less challenging. Plus, interns were working virtually in the comfort of their homes. Gill (2020) also found similar realizations from their respondents, that interns had a relaxed working environment. Adding to the fact that all work activities were digital or done online, students were not able to have physical interaction with the books and the library. Although they were able to experience challenges in the virtual internship, they might still be longing for the different challenges encountered in a face-to-face internship. It cannot be denied that there are interns that mentioned they learned how to handle the pressure and challenge faced in a virtual workplace and were positive that they could do it also in the future.

## 6.7. Internship Framework

This proposed model consists of three stages, namely: pre-internship preparation, internship process, and post-internship, which may find similarity with Sweitzer and King (2019)'s Developmental Stage Model of Internship and other internship models (Kiser, 2015; Woodside, 2017) (Fig. 1).

### 6.7.1. Pre-internship Preparation

Pre-internship preparation is an essential step for LIS students who are about to embark on an internship experience. This stage involves preparing for the internship before it begins. Activities in this stage include researching

the company or organization, reviewing internship requirements, identifying learning goals, preparing a resume and cover letter, practicing interviewing, connecting with mentors or advisors, and preparing for the first day of the internship.

In a virtual internship, pre-internship preparation may involve additional steps such as ensuring that the intern has access to the necessary technology and software, setting up virtual communication tools, and clarifying expectations for remote work. The intern may also need to prepare a dedicated workspace and ensure they have a reliable internet connection.

In the model of Sweitzer and King (2019), students have things they look forward to, as well as things they are anxious about. That is why internship orientations are important onboarding activities for interns. This stage covers the first two stages of Kiser (2015)'s model, the pre-placement and initiation stage. This model recognizes the behind-the-scenes preparations including making all parties involved aware of the program objectives. Besides preparing students with technical and technological concerns focused on the achievement of program objectives, as the study also revealed challenges experienced by virtual interns, this stage must also include mental state, time management, confidence, communication skills, and their ability to manage their tasks and so on. Diambra et al. (2004) recommended making a list of anticipated signs of stress and coping strategies.

### 6.7.2. Internship Process

The internship process typically involves several key steps that help ensure a successful and productive experi-

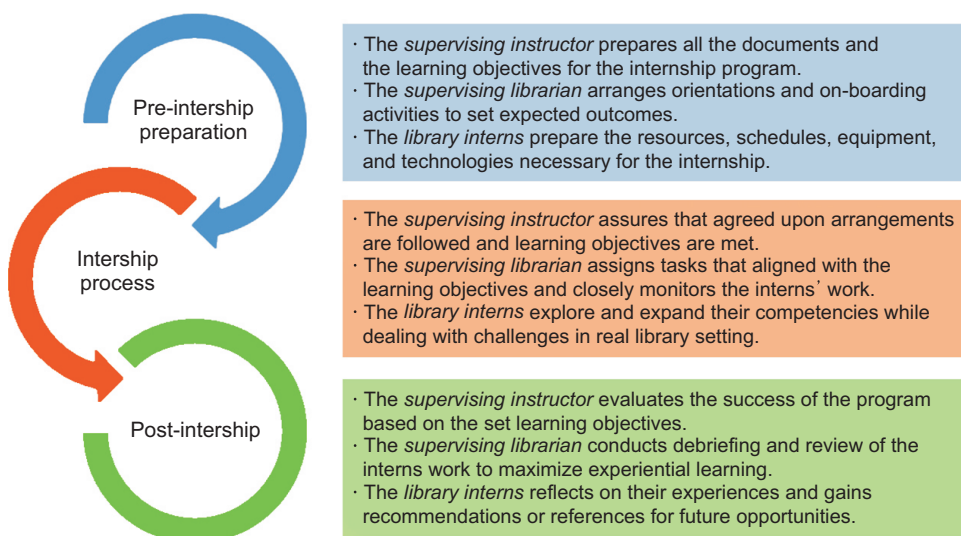


Fig. 1. Internship model.

ence for both the intern and employer. This stage involves the actual internship experience. Activities in this stage include receiving regular feedback, developing new skills and knowledge, and behaving professionally while dealing with real workplace challenges in the library. Interns employ various coping strategies in this stage to overcome those challenges.

In a virtual internship, the intern may work remotely, which requires additional communication and collaboration skills to stay engaged and connected with the supervisor and colleagues. The intern may participate in virtual meetings, collaborate on shared documents and files, and communicate through email, instant messaging, or video conferencing.

Sweitzer and King (2019) identified the in-between stages exploration and competence in the developmental stage model. Woodside (2017) identified two stages as well, which are increasing participation and expanding skills. Kiser (2015) termed this as the working stage. All of these identified that this is where the bulk of internship activities are done. It is where interns engage in working, explore the workplace, and increase their participation with workmates or co-interns. This is also where they develop competencies and expand their skills. This calls for the need to develop training guides for librarians as well as learning resources that would benefit the supervising librarians and interns. As the study discovered the usefulness of scanned notes and information resources among interns, such references should be packaged with the interns as they are deployed to various libraries.

### 6.7.3. *Post-internship*

A post-internship activity is an important step for interns to reflect on their experience and to transition into their next phase of professional development. This stage occurs after the internship has ended and involves reflecting on the experience and transitioning to the next phase of professional development. Activities in this stage include debriefing with the supervisor, updating resumes and portfolios, reflecting on the experience, networking, and staying in touch, evaluating career goals, providing feedback, and expressing gratitude.

In a virtual internship, the post-internship stage may involve additional challenges such as ensuring that the intern has access to references and recommendations from the supervisor and colleagues, as well as finding ways to maintain connections with the company or organization after the internship has ended.

Woodside (2017) referred to the internship conclusion

as the leave-taking of interns, which required an orderly transition of the roles and responsibilities that an intern assumed. Apart from assuring a smooth transition, Kiser (2015) emphasized that this final stage (termination stage) is a time for reflection that provides students with an ideal opportunity to examine and work on these patterns and skills. Quijano (2015) highlighted that reflection enables students to describe an ideal librarian and plan their career in LIS based on the LIS-related tasks they carried out and competencies they have acquired during the practicum. Sweitzer and King (2019) stated that the culmination stage required settlement of concerns to avoid a sabotaged perception towards their experience. In this study, the reflections helped students conduct self-assessment and an evaluation of the internship site and supervisors. In fact, there should also be assessment mechanisms for supervising librarians for them to reflect whether they have also contributed to the development of the professional and personal skills of the interns.

## 7. CONCLUSIONS

Interns expected to gain knowledge and skills on the operation, services, organization, roles and responsibilities of librarians, and new ICTs from the library and from librarians, regardless of the mode of their internship. Although they were not initially prepared, the orientation helped them identify what they should prepare, such as computers and a stable internet connection, as well as the necessary knowledge and skills for them to accomplish the tasks assigned to them. Challenges brought by procrastination were further aggravated by technical difficulties such as server shutdowns, slow internet connections, power interruptions, and incompatible devices. The interns employed avoidance strategies as coping mechanism or taking a break from school, work, and household responsibilities. The interns had an opportunity to learn and navigate the online digital system of the library despite the pandemic. They were given a chance to experience digital library work and develop the technical and soft skills needed for their future employment. Most importantly, the interns realized their capacity and reflected on which competencies need improvement. They were also able to realize the importance of the librarians' job at the same time as the needed knowledge and skills to function as one. In conclusion, virtual internship can still offer the benefits of a traditional internship. Although virtual internships are no substitute for face-to-face internship, students still learned the necessary knowledge and skills of

a librarian; experienced the challenges faced in an actual library and were provided with various opportunities and realizations.

The proposed framework outlined various stages in an internship. Initially, the pre-internship stage is focused on establishing expectations and preparations for all parties involved. This stage involves setting objectives and conducting orientations. Next, the internship process involves interns expanding their skills and dealing with challenges encountered in a library workplace. Finally, the post-internship stage involves the translation of the entire experience into meaningful takeaways such as career opportunities and realizations. This stage includes assessments and feedback as closure for the program. While the model has not yet been tested and validated, this study aims to offer a comprehensive guide for the supervising instructor, supervising librarian, and library intern through these stages.

## CONFLICTS OF INTEREST

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

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## APPENDIX. Sample journal entries

“Oh no ... how can I handle everything?” This was my first reaction to the internship as I found out that it would be conducted online. Due to the outbreak, most of my daily activities were affected. I have to establish a new schedule for me to follow and learn to organize it as well. In the very beginning, I felt that I would really have a hard time undergoing an internship program, but I realized that I shouldn't overthink for possible things to happen because I didn't even know what was going to happen. Sometimes, this was challenging, but I also tried to look at it as an opportunity. I know that an online internship can be just as helpful as an onsite experience if I focus on the tasks assigned to me. I felt excitement when I found out that I would be assigned to the Benguet State University (BSU) Library. Just because I really wanted an internship that would prepare me for my chosen career path. I think that my internship at the BSU library would be good, and this internship will teach me exactly all of the essential skills and tasks needed to have a career in my field. My expectations for this online library internship program are to learn as much as possible about the daily functions of the library. I'm expecting to learn about the library management and have an actual work experience about cataloguing of books and to learn about other library tasks. I also expect that this internship would be a good way of broadening my knowledge of a career in the field of library science. When it comes to the cooperating library and librarians, I expect them to provide me with the opportunity to learn and grasp the possible activities in this internship in a way that I can understand. Upon accomplishing this internship program, I expect that this internship will give me that hands-on experience I need. I expect that this internship will help me build up my knowledge of responsibility, positivity, and focus. I had to be responsible for my activities. I have to accomplish it, not just by compliance. It's a responsibility that needs to be achieved. I had to be positive and stay focused on the things I do. As an intern, I expect my co-interns to be a contributing member of the team. In this matter, I remember something remarkable about the cone experience topic we have tackled with Ma'am Lascano that “the best way to learn is by doing.” Yes, interns like me must interact with the environment in order to adapt and learn. In the field of library science, the best way to learn how to do a specific job is to simply try doing the job and at the same time understanding what you're doing.

If I were to ask if I am prepared for an online internship, I would say that I'm not actually prepared. How can I be motivated? What are the possible changes and adjustments I could do? These were the questions running through my mind. But I know that this internship was very important, and it's a great opportunity for a college student like me. When it comes to the preparation for the internship, I did some changes with my daily schedule. The significance of that is for me to stay committed to my new schedule in order to develop good study habits. Planning and setting goals is important. Without a specific plan and defined strategy, it would be hard to propose a new initiative through completion. Thus, setting and reaching goals makes me feel a sense of accomplishment.

Just as I said, everything is changed tremendously due to the pandemic. We are now living differently in the way we lived before. We are now having the world of the virtual era. I am taking my degree virtually since the last semester so, I am sort of used to this online setup. I am truly grateful that I was assigned to BSU where I am studying the degree I am taking, which is Bachelor of Library and Information Science, so there are not many adjustments at all instead, preparing myself to be more attentive and efficient even if it is virtual. I have to be more organized especially the files on my laptop so, I will be managing my future tasks in the library efficiently and effectively. We are seven in our group for this internship. Only three of us in our group can visit the library whenever it needed. When the three of us visit the library as an intern, (disclaimer: we followed the Inter-Agency Task Force protocols which are wearing our facemasks and face shields properly) we received a warm welcomed in each library staff inside the BSU library. Our instructor made a good job on introducing us the things we have to do, things we need to prioritize in the library tasks, things we should not do and things we should know about being a library staff. Communication skills are a must in a job qualification. Our instructor gave us an open communication. At the back of our minds, we did feel intimidated and nervous to ask too many questions because we did not want to admit or ashamed that we don't understand some library tasks and that we needed extra help with something. Blessed because our instructor let us get over that hesitations and fears because he made us realized that asking questions are the only way to learn what we are really supposed to be learning and doing. He also mentioned that he actually appreciated it more if we asked questions to make sure we really understood what it was doing and that we did it correctly. If we had not worked with such cooperative and helpful instructor, we probably would have been too

uncomfortable to ask questions in our future company or organization we will work on. Now, that we know it is not bad to ask, we won't have to struggle with it in our future job.

We were assigned a number of activities, namely: making our work plans (individually and by group), assisting in the creation and completion of a series of videos on information literacy, writing a book review, cataloguing activities with e-books and the university's cataloguing system, and currently—assisting in library activities either as a facilitator, or a participant, or both.

Thinking about them all as tasks on a to do list has been both helpful and daunting. It's a little frustrating when you have so much to do that you don't know exactly where or how to start, then again, starting is usually that hardest part for me. But as soon as I find a flow or get in the zone, I get things done. I've started writing physical to do lists and taping them up where I can see them and that usually helps keep me from getting distracted. Music or any sort of background noise I find I can work over helps me concentrate. Baking shows, or any shows where people make things serve that purpose well, Music has been constantly teetering between heavy metal, instrumentals, and indie/folk (probably to the annoyance of anybody who can hear it).

Coordination, collaboration, and synergy has been moderate. It's easy to leave a message for classmates to read, But the time it takes for them to reply (if at all) varies. My groupmates however, have been fairly proactive, and my instructor makes asking questions a lot less frightening.

The task I probably had the most fun with might be the voice recording for the infographics. I wish I could have been able to produce something with a better quality, but I've been limited by the things I have to record with. Still, it was something I could do and do well. The task I enjoyed least has to be the cataloguing activity. I recognize its significance and the difficulty itself was part of a healthy challenge, my frustration lies with the errors in the system and how many careless mistakes I've made (mostly because of my clumsiness and inexperience). I've finished cataloguing the books I've been assigned, and yet I can't have them checked because the system is out of order again. I might be getting a bit too riled up about this though. I've never been the most patient person. I worked with my co interns well, especially with my groupmates, who were understanding and easy to talk to.

There have been quite a lot of difficult things going on outside of school that have made concentration hard and any effort feel like something that isn't worth doing. I'm sure plenty of others are going through the same thing. I've had to deal with the loss of a family member with whom I have had a complicated and mostly negative relationship with, and that turmoil is felt even now. During that period, my co interns have been patient with me, even when I spoke little of my situation. They didn't rush me to finish output, or hassle me into doing something. They thanked me for my contributions, and that made me feel like I've been helpful, and that what I had done for the group has been enough.

I've mentioned this before and I probably risk sounding like a broken record but he has been very kind and approachable and easy to talk to, even about mistakes, which can be daunting for most students to come forward with. There was a moment during the cataloguing activity where I had made a few careless mistakes, the library catalog suffered unnecessary changes because of that, if I hadn't brought this to the attention of our course facilitator as soon as I did, I probably would have done more damage. He was quick to clarify and correct without humiliating me or making me feel like a dunce.

This month might have been the most stressful out of all of them. Aside from the library system going down for the longest time, I've just found out that most of the work I've done is gone without much hope for recovery. Pretty bleak, considering how hard that was for me to get done. Making lists, which has helped in past in keeping my mind organized, has turned into something that gives me more stress.

It was, and still is very hard for me to concentrate. I have no idea if it's the persistent issues I have with my brain or the environment I have to work in or both, but it's been pretty detrimental to work and progress. I know what I have to get done, but actually getting them done feels absolutely monumental. It's gotten worse throughout the month and I've had more breakdowns and burnouts than I care to count.

Finding some time to indulge in new hobbies has somehow supplied me with a few moments of peace. To deliberately step away from schoolwork and my computer for a while to do some exercise, or to plant something. Gardening, in particular is something I've found to be incredibly therapeutic (something about getting your hands into good soil and

seeing something grow, but I won't go too into that). I haven't had much time to do much of it at all these past few weeks however.

One of my realizations during the internship program is that staying connected with my co-interns and teacher is important. No man is indeed an island because, at the end of the day, I still need to cooperate and ask for help from my co-interns and teacher to get the tasks done successfully. In addition, I need always to stay active on my accounts (messenger and google classroom) to be updated with the activities and announcements of my teacher since the mode of the internship program is online. Even though I am at home, I should be aware of my class schedules and manage my time properly. Lastly, as an intern, I should always put effort and be responsible enough to do the task assigned. The online internship is difficult but the experience is enjoyable and worth it.

The aspect that I wanted to improve on myself is on time management because I admit I have a procrastination habit. Because of this negative habit, the quality of my works is being affected. On the other hand, I also wanted to improve more my cataloging skills. I still commit errors more specifically on using punctuations and sometimes I am not confident on the information of the book that I input in the system. On the internship program, it would be nice if it will be a blended internship (online and onsite) if the protocols are not already that strict for us to gain more experience. I don't see any aspect that still needs improvement to our course facilitator because he guided us well throughout the online internship and he is also approachable in times we encounter difficulties with the task given to us.

"Quality over quantity" - these are the words that our teacher always reminds us of when doing our activities. It encapsulates my whole experience as a student library intern because in all of the tasks that we have done one common thing that I learned is to always assure quality. For example, finishing cataloging all the titles of the book assigned to me will not mean that I finish the task successfully if there are too many errors that I commit. Carefully and properly cataloging the book in the system with the correct tags and punctuation will more matter even if a lot of records still await to be finished. Throughout my internship experience, I learned that the amount or number of what we have accomplished is not what really matters rather it is the standard and value of what we have accomplished.

# Pagoda Data Management and Metadata Requirements for Libraries in Myanmar

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## ABSTRACT

The storage of data documentation for Myanmar pagodas has various issues, and its retrieval method causes problems for users and libraries. This study utilized a mixed-methods approach, combining qualitative and quantitative methods to investigate pagoda data management in Myanmar libraries. The study aims to achieve the following objectives: to study the library collection management of pagodas in Myanmar, to investigate the management of pagoda data in Myanmar libraries, and to identify the pagoda data requirements for metadata development from the library professional perspective. The study findings revealed several challenges facing librarians and library users in accessing and managing Myanmar pagoda data, including limited stocks and retrieval tools, difficulty in accessing all available data online, and a lack of a centralized database or repository for storing and retrieving pagoda data. The study recommends the establishment of metadata criteria for managing a set of pagoda data and improving access to technology to address these challenges.

**Keywords:** Myanmar pagodas, pagoda data management, pagoda metadata requirements, Myanmar university libraries, Myanmar national libraries

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## 1. INTRODUCTION

Historically, the history and significance of pagodas were recorded on folded paper, palm-leaf manuscripts (*parabaik*) (Universities' Central Library, 2015), and inscriptions. Today, these records are typically authored and published by either historical authors or pagoda trustee members. Libraries preserve pagoda-related resources such as books, inscriptions, palm-leaf manuscripts, *parabaik*, folded pieces of paper, and electronic books. The University's Central Library (UCL) (Nwe, 2018) and the National Library (Htwe, 2016) in Myanmar have acquired palm-leaves and *parabaik* from owners and monasteries. The UCL website showcases the color *parabaik* that King Mindon used to renovate ruined temples and pagodas. Additionally, pagoda donation information is written on palm leaves that have been manually collected. Documents of palm leaf or *parabaik* can be accessed on the national library website. Furthermore, information about pagoda history and records can be obtained from the community or on stone inscriptions. Documentation about the pagoda repair process is carried out by the Ministry of Religious Affairs and the Ministry of Culture (Aye, 2020). The Department of Archeology and National Museum, along with local and foreign specialists, have conducted a documentation project that includes three-dimensional laser scanning of Bagan pagodas (Coughenour, 2022).

Libraries play a crucial role in acquiring, organizing, storing, and retrieving various resources such as books, journals, magazines, and audiovisual materials. A reliable data management system is essential to meet the needs of users and ensure efficiency. The Library Management System (LMS) is a specialized software that stores and organizes collection and user data, including borrowing history, preferences, and demographics. The library system consists of cataloging, search and retrieval, reporting, integration with other software systems, reference management, and document management capabilities. Libraries use Digital Management Systems to manage data and support users (Tochukwu et al., 2015). Metadata helps users understand and use data by describing its content, context, and structure (Gilliland, 2016; Riley, 2017). Metadata in libraries includes author, title, subject, date of publication, shelf location, and more. E-books, databases, and online journals require metadata management. Metadata is essential for resource management and system integration.

The ancient Myanmar library (*Pitakat Taik*) held Bud-

dhist scriptures (Allon et al., 2016) and other literature. The structure was designed in the form of a temple, and examples include the Anawrahta *Pitakat Taik* and the Amarapura *Pitakat Taik* (Revolutionary Government of the Union of Burma, 1963). The British colonial Bernard Free Library founded the modern library system in 1883. Rangoon's 1952 National Library of Myanmar collects and preserves Myanmar's cultural heritage (Oo, 2018). Today, it remains the largest and most significant library in the country, managed by the Department of National Libraries and Archives under the Ministry of Religious Affairs and Culture (Aye, 2020). The Yangon and Mandalay universities have large academic book and journal collections. Despite the growth of these libraries, access to information remains limited, especially in rural academic libraries where they lack modern facilities and technology due to limited funding and resources (Nyein, 2016). Many Myanmar libraries still use manual LMS, and automation is still rare. However, the eLIB library automation system has greatly improved library services and information access. Yangon's and Nay Pyi Taw's national libraries have advanced technology and funding for conservation and digitization (Kaung, 2012). Their online union catalogue holds rare Burmese books, manuscripts, educational reports, and audio and video resources. Myanmar libraries are working with international organizations and government agencies to improve information access and library services. There are 55,755 registered public libraries that are operated by the Ministry of Information, Myanmar, but they only use manual systems for cataloging and circulation (1World Connected, 2017). Private community libraries have been successful with support from donors and Ooredoo Myanmar, using library automation or manual systems. The "Save the Library" initiative has a website and mobile app providing information on various topics, including contact information for public libraries.

The Myanmar Museum protects ancient palaces and libraries, and every archaeological site has a museum. The Mrauk U Archaeological Museum (Zan, 2016) and Bagan Archaeological Museum (Aung, 2018) were founded to preserve many pagodas. These museums display miniature pagodas, inscriptions, and Buddha images. The Shwedagon Pagoda Museum in Yangon displays old lotus petals, bananas, buds, and umbrella crowns, while the Mahamuni Pagoda Museum in Mandalay has a bronze statue and other exhibits.

Previously, the rector committee of the Myanmar Academic Library Consortium (MALC) held a meeting to discuss the implementation of a digital library at the

university. Following this, the university rector approved the transformation of the library's digital infrastructure (Nyein, 2016). However, various obstacles hindered progress, including limited Internet bandwidth, a tight budget, and the absence of a qualified library technician. Additionally, the costs of establishing, processing, and analyzing large datasets must be taken into account.

Thus, this study aims to examine the current LMS, report on its findings, and generate metadata for Myanmar pagodas. These elements are all crucial for establishing a digital library environment. The metadata will be particularly useful for libraries responsible for preserving cultural heritage items and religious monuments, as it will help to maintain accurate and up-to-date information.

## 2. RESEARCH QUESTIONS AND OBJECTIVES

The storage of data documentation for Burmese pagodas in Myanmar libraries has various issues, and its retrieval method causes problems for users and libraries. To address these issues, this study will focus on creating metadata for Myanmar's pagodas. The research aims to answer the following questions: 1. How does the library manage the pagoda collection? 2. How is the library's pagoda data currently managed? 3. What type of information do library professionals want to include in metadata? The study seeks to investigate and provide solutions to the above issues by analyzing the library's management system and the pagoda data storage process. The research will find out what information library professionals think should be in metadata. This will make the retrieval system more effective and efficient.

The primary objective of this research is to examine the data management system for pagodas and libraries in Myanmar. This study aims to achieve the following objectives: (1) To study the library collection management of pagodas in Myanmar; (2) To investigate the management of pagoda data in Myanmar libraries; and (3) To identify the pagoda data requirements for metadata development from the library professional perspective. By fulfilling these objectives, this research will contribute to the development of a better data management system for Myanmar pagodas and libraries. The findings of this study will provide valuable insights into the library's metadata development process, ensuring a more efficient and effective retrieval system for pagoda-related data.

## 3. LITERATURE REVIEW

Multiple studies have been conducted on library services in universities across Myanmar. For example, Aung (2018) highlighted the need for Pyay University Library to enhance its services to meet users' demands. The author conducted a comparative study of university libraries in Bago, Pyay, and Taungoo, and recommended acquiring more books and periodicals. Oo et al. (2022) evaluated the Yadanabon University library from 2000 to 2021, assessing its collection, customer service, and information demands over time. The study identified the library's strengths and weaknesses and emphasized the importance of providing adaptable and diverse resources, improved services, and facilities. Another study by Swe and Yang (2021) focused on the accessibility of databases, information sources, library catalogs, and scholarly papers through library websites. The study examined six Myanmar university library websites, including University of Yangon, Universities' Central Library, University of Computer Studies Yangon, Yangon University of Foreign Languages, East Yangon University, and Dagon University. The survey assessed the performance, efficiency, usage frequency, satisfaction, skillfulness, and convenience of these websites, highlighting the need to improve university library websites to enhance customer satisfaction. In 2016, MALC was established with nine universities, and it has since grown to include forty-six academic libraries, of which forty-one are public university libraries. MALC provides extensive training for library staff and librarians, including workshops on library management and research support, capacity building, digital information literacy, and research training. Additionally, MALC has acquired licenses for electronic resources and plagiarism checkers, which are shared among its member libraries in Myanmar (Oo, 2016a). In a separate study, Oo (2016b) analyzed the preservation of palm-leaf and parabaik manuscripts in Yadanabon University, identifying valuable historical records and recommending their digitization. The manuscripts contained information on generalities, history, architecture, and religion on the parabaik. While there may not be any special research on the topic of "pagoda data management in Myanmar libraries," numerous studies have been done on the management and services provided by libraries in Myanmar universities.

There have been many reports for national libraries. Oo (2018) provided discussion of the recent developments and initiatives taken by the National Library of Myanmar. It has many books, periodicals, journals, newspapers, and

other items, including rare publications and manuscripts. To support research, the library buys local and foreign-language literature and interacts with academic libraries, archives, and publishers. The library's online catalogue offers a hybrid approach that combines traditional library operations and automation tools. Aye (2020) reported the history, status, and future of the National Library of Myanmar. It collected books, manuscripts, and digital collections, and collaborated with government and private organizations on collection development and library services. There were only a few visitors a day to the library due to its location. It had 120 employees and an average annual budget of 150 million Myanmar Kyat, which is about \$1,500 USD, for collection development.

The Ministry of Religious Affairs and Culture is responsible for preserving Myanmar's religious and cultural heritage, including pagodas, with the Department of Archeology and National Museum overseeing their preservation and development. They collect and preserve artifacts and documents related to pagodas, while also collaborating with volunteers from other countries. The department disseminated information about pagodas through their Facebook page and published research papers, but the information was not widely available. They have collected inscriptions, parabaik, palm leaves, and other ancient documents related to pagodas. The Kabaaye Buddha Research Library's website has an extensive collection of full-text files about Buddhist scripture, Pali texts, monastic history, Buddhist literature, and pagoda histories, but only 64 of these books are pagoda-themed. The Myanmar National Archive has digitized various ancient governmental documents, including those related to pagodas, which can be accessed by visiting the archive in Nay Pyi Taw.

### 3.1. Myanmar Libraries Management System

According to Maw (2016), Computerized Documentation Service/Integrated Set of Information Systems (CDS/ISIS) was used between 1985 and 1997, but only in English. Since 1997, the eLIB library integrated system has been in use, which supports both Myanmar and English languages. eLIB is a web-based and union catalog system (Naing, 2018) that also provides access to e-books in PDF format and videos (Bhandari, 2023).

According to Htut (2017), the Online Union Catalogue of Myanmar Academic Libraries was a collaborative effort of university libraries in Myanmar, led by the UCL. Member libraries are required to send their book lists to the UCL to be included in the online library catalog. However, libraries must pay a fee if they want to add their book lists

to the national library's union catalogue system, which is why no library has done so yet.

### 3.2. Pagoda Data Management

According to Tha (2010), the Dewey Decimal Classification (DDC) system is used by all libraries in Myanmar to organize pagoda-related books on their shelves. The DDC number for Myanmar pagoda books is 294.3435, which can be broken down as follows: 2 (Religion), Other and comparative religion (9), Religions of Indian origin (4), Buddhism (3), Doctrines and practices (4), and Pilgrimage and sacred places (35). Additionally, libraries use extended numbers for specific areas, such as Kachin State (1), Kayah State (2), Kayin State (3), Chin State (4), Sagaing Region (5), Taninthayi Region (6), Bago Region (7), Magway Region (8), Mandalay Region (9), Mon State (10), Rakhine State (11), Yangon Region (12), Shan State (13), Ayeyawady Region (14), and NayPyiTaw (15) in accordance with Myanmar's Constitution (2008) (Comparative Constitutions Project, 2008). For example, the DDC number for books related to the Pagoda of Ton Kwe Ceti in Kayah State would be 294.3435092, which includes the specific area extension. However, most libraries use the general DDC number of 294.3435 for pagoda-related books.

## 4. SCOPE OF THE STUDY

The library possesses data related to pagodas, and its staff and librarians have experience managing such data. This research involved eight participants. The scope of this qualitative study was limited to seven select university libraries located across Myanmar and the National Library (Yangon). The participating academic libraries were the Yangon Economic University Library, Yangon University Library, Sitagu International Buddhist Academy Library, Yenangaung University Library, Yadanabon University Library, Mandalay University Library, and Kyaukse University Library. For the quantitative research, an online Google form was sent to member libraries of MALC (Oo, 2016a) and national libraries. The purpose of this research was to investigate and analyze the management of pagoda-related data in libraries across Myanmar, and the study's findings will provide valuable insights into developing metadata for Myanmar pagodas.

## 5. RESEARCH METHOD

The present study utilizes a mixed methodology of

both qualitative and quantitative data collection and analysis techniques to gain a comprehensive understanding of the library system for pagoda data management, the demand for pagoda information, and metadata concerns in Myanmar libraries. For the qualitative study, eight participants were selected for this study using purposive sampling based on their knowledge about pagoda data and expertise in library services, which included library staff, librarians, and retired experts who were interviewed using a semi-structured approach to explore pagoda data in the libraries. The interviews were conducted online and audio-recorded with participants' consent. For the quantitative study, a questionnaire was developed to investigate pagoda data management and necessary metadata elements in libraries of Myanmar, including 23 university libraries of the MALC membership and two national libraries. Two questionnaires were sent to each library via email or social media private accounts to collect data from the decided representatives of the library who were most involved with library information resource management and pagoda data management. Fifty-seven questionnaires were returned, of which at least one questionnaire was returned from each library.

The qualitative data analysis process typically involves organizing and coding the data, identifying patterns and themes, and interpreting the results. In this study, recorded interviews were transcribed verbatim and analyzed using thematic analysis. Independent codes were used to analyze the transcripts, and themes were identified from the codes to gain insights into pagoda data management systems and metadata development. After analyzing the data, the researcher drew conclusions and made recommendations based on the findings. For the quantitative component of the study, SPSS was used to analyze the data obtained from the questionnaire survey. The overall responses of survey participants to each question were calculated by conducting a frequency analysis for each question. This allowed for a comprehensive understanding of the trends and patterns in the data collected. Given that the random sampling method used in this study ensures that the sample is representative of the entire population of libraries of MALC member libraries and national libraries in the country, the results of the data analysis can be generalized to the broader population.

The research findings highlighted the importance of using multiple data collection methods to gain a comprehensive understanding of the research. During the interview, in cases where participants misunderstood the questions, the researcher sought clarification by rephrasing

the queries. While half of the participants indicated that the metadata element in question should be added, the remaining half expressed uncertainty. In order to validate these findings, a survey form was administered, wherein the same question was posed once more.

The researcher followed the Khon Kaen University's Ethics Committee for Human Research rules and got a certificate with the number HE 653250 on October 10, 2022.

## 6. FINDINGS AND DISCUSSION

### 6.1. Respondents' and Informants' Background Data

According to the results of the qualitative research, the study was mostly about librarians and library staff from different universities in Myanmar. The participants included a retired librarian from Yangon University, a library assistant from Yangon University of Education, a librarian from Sitagu International Buddhist Academy, a library staff member from the National Library in Yangon, a librarian from Yenangyaung University, and library staff members from Yadanabon University Library, Mandalay University, and Kyaukse University. Their educational backgrounds varied, with some having degrees in science (such as chemistry, physics, and zoology) and others in the humanities (such as history, geography, and the Myanmar language). All of the participants held a diploma or master's degree in library and information studies, one participant received a Master of Research of Library Studies, and their work experience ranged from 7 to 36 years. Some had experience in electronic and online library services.

In the quantitative study, it was found that the majority of respondents (56.1%) held a master's degree in Library and Information Science, while 21.1% had a diploma and 17.5% had other degrees. In terms of work experience, 38.6% had worked between 11-20 years, while 31.6% had less than 10 years of experience. The largest group of library staff members were library assistants (1-5), accounting for 56.1% of the respondents, followed by assistant librarians (21.1%), others (14.0%), and librarians (8.8%). The most common library staff skill reported was circulation (36.8%), followed by digital skills (24.6%), and cataloguing (3.5%). All respondents reported having library staff skills.

### 6.2. Library Collections of Myanmar Pagoda

Based on the interview results, Mandalay University and Yadanabon University libraries have a collection

of Myanmar pagoda research papers written after 2010 stored in their computerized systems. These research papers are likely organized based on the year of publication or accumulation. It is also mentioned that before 2010, research papers related to Myanmar pagodas were only available in print or hard copy. Other libraries are not known to store electronic versions of the research papers.

Seven of the participants said that their library users had frequently used their services for local research projects such as theses or term papers. Academic researchers in the fields of archaeology and history demand information on Buddhist art and architecture, comparative design and history, connections with the Kingdom's ideology, history, philosophy, economy and policy, conflict history, changing processes of design, technique or theory, external culture explosion design, various designs upon geography or race, preservation and restoration materials and methods, stone, bronze and iron Buddha images, and protection and preservation management systems. One of the participants stated that tourist freelance researchers and regular readers come to the National Library (Yangon) to access information on related pagoda names, history, conflict history, and significant topics in both English and Myanmar languages.

Table 1 presents a quantitative analysis of library information resource management and systems in Myanmar, with a focus on pagoda collections. The sample comprised 57 respondents, who reported using various library automation systems, including eLIB commercial software (50.9%), Solib commercial library automation software (8.8%), both softwares (10.5%), and other software (29.8%), which encompasses both commercial and open-source solutions. Regarding data management systems, the respondents reported using manual card catalogs (33.3%), computerized catalogs (29.9%), online library catalog systems (1.8%), and both card catalogs and

computerized systems (35.0%). For electronic resource storage, the majority of respondents (72.2%) reported using computer storage, Google Drive, and other online storage solutions, while a smaller proportion reported using compact discs (CDs) and digital versatile discs (DVDs) (17.0%) and hard disks (5.3%), while a small percentage (5.5%) reported having no electronic storage at all. The respondents also reported having special collections in their libraries, including palm leaf, manuscript, and folded paper materials (14.0%), rare book collections (19.8%), and donor or author collections (30.3%). The remaining percentage included all of these special collections. The study also suggests that libraries should expand their special collections to meet the diverse needs of their users.

### 6.3. Pagoda Data Management in Libraries in Myanmar

#### 6.3.1. Retrieval of Pagoda Data Storage Places

The retrieval and storage system of pagoda data is a complex and challenging task because the records and manuscripts stored in these locations have been lost or damaged beyond repair. However, there are ongoing efforts to preserve and protect these important cultural artifacts. Additionally, there are efforts to digitize manuscripts to make them more accessible to scholars and researchers around the world. Several universities and national libraries have collaborated with Myanmar libraries to digitize manuscripts that included pagoda data. On the other hand, traditional ways of storing and organizing information, like open shelf systems and library catalogues, are still the main ways to find and get information in these libraries. An electronic data management system is not used in these libraries for electronic books. The electronic resources for pagoda data are not assembled individually; rather, they are assembled along with other data on CDs, and DVDs (Finch & Webster, 2008), or other computer

**Table 1.** Quantitative data of library information resource management and systems in Myanmar libraries from the respondents' views (n=57)

Library automation system	Data management systems	Storage of electronic resources	Special collections
eLIB commercial software (50.9%)	Manual card catalog system (33.3%)	CDs, DVDs (17.0%)	Palm leaf, manuscript, and folded paper (14.0%)
Solib commercial software (8.8%)	Computerized library catalog system (29.9%)	Hard disks (5.3%)	Rare book collection (19.8%)
Both software (10.5%)	Online library catalogue system (1.8%)	Computer storage, Google drive, and other online storage (72.2%)	Donor or author collection (30.3%)
Other software (29.8%)	Both card catalogue and computerized system (35.0%)	None (5.5%)	-

CDs, compact discs; DVDs, digital versatile discs.

storage systems. Instead, users must look for information in the library's catalogue or by searching the Internet directly for the name of the pagoda.

Based on the interview results, it was discovered that the Myanmar Archeology Department has only one research and training sub-department within the institution and owns a library with a limited number of registered books. Additionally, the data is recorded in register books, and there is no comprehensive library system in there. The system utilizes a manual storage system that may face challenges in managing large amounts of data. Despite this, preserving the pagodas is essential for the department, and research can provide valuable insights into Myanmar's history, architecture, and culture. However, the limited dissemination of research papers hinders the sharing of knowledge and impedes future research. To improve, the system needs to explore digital storage options and increase the dissemination of research findings.

### 6.3.2. Information-Seeking Patterns

The information-seeking pattern in the library involves users approaching reference librarians for assistance in locating data (Sinha, 2015). The librarians may suggest various search methods or resources, including interlibrary loan. In Myanmar, the user can find general historical books, historical theses, archeology theses, and research reports about Myanmar pagodas by using library catalogs or registered books. In some cases, researchers and local scholars search for well-known authors who have many years' experiences of pagoda data finding, such as Dr. Gordon Hannington Luce and Dr. Toe Hla. Myanmar authors who have written about Myanmar pagodas in English include Dr. Khin Maung Nyunt and Dr. Thaw Kaung. Occasionally, users knew previously which respectable translators to seek out in the library collection. In a different search strategy, users utilize keywords such as "Myanmar pagodas," "Buddhist architecture," and "Buddhist temples" to find books and articles written regarding Myanmar pagodas. As a result, pagoda names, author names, translator names, and key words are essential data elements to search for pagodas.

### 6.3.3. Important Information in the Search for Myanmar Pagodas

The interview result of identifying important information in the search for Myanmar pagodas revealed that: One participant mentioned the "Title" and "Location" where a pagoda was placed. The subject also mentioned the "similar name" of the pagoda, which is the name for

the length of the structure of the pagoda or the Buddha image. Thus, the method of construction consisted of building a bamboo scaffolding that reached a height of six stories, so it was called a six-story pagoda such as the Ngahtatgyi Buddha Temple (Yangon) or Ngahtatgyi Buddha Temple (Sagaing). Also, the "Date" of the founding is a follow-up preservation date, renovation date, or a crashed-down date that is man-made or via a natural disaster: for example, Bagan Period Pagodas and Innwa Period Pagodas.

Other participants mentioned the "Related History" of a pagoda, which contained information about the pagoda's history and remarkable attributes, such as praying for one's wishes while traveling to four different pagodas in one day to fulfill those wishes. One participant stated that the user needs regional pagoda information that was written in the ethnic languages.

Seven of the respondents stated that the user solely searches for the names of individual pagodas for the sake of either personal interest or academic study. If users were planning a trip to a place with many pagodas, they could have looked for information about famous pagodas.

### 6.3.4. The Problem of Pagoda Data Management

There have been found to be three major challenges in pagoda data management, as determined by this study's findings. Firstly, the current tools for retrieving pagoda data are time-consuming, since users must access manual library catalog tools or a computerized catalog on a library computer, which requires them to physically visit the library. Remote access to library resources is not available. Secondly, half of the libraries surveyed reported insufficient resources, making it challenging to meet user needs and demands regarding pagodas. Library staff struggle to find and remember articles on pagodas in daily newspapers, journals, or magazines, leading to dissatisfied and unhappy library clients. Finally, CDs and DVDs were used to store digitized books found on Google, and they were arranged by subject in a computer database. However, Google does not have sufficient information on pagodas in Myanmar, making it challenging to build a comprehensive database.

### 6.3.5. Pagoda Data Demands

A few decades ago, pagoda data in the national library in Yangon was arranged geographically, with materials organized by region under Rakhine State and Yangon Region. However, the collection is now organized using the DDC system. UCL, Mandalay University Library, and the

national libraries have a strong budget and can collect and update books on pagoda data. However, 73.0% of libraries are unable to meet the requirements for pagoda data. In both the national and university libraries of Myanmar, the traditional card catalog system is still in use.

Users search for pagoda data by various criteria, including name, parallel name, common name, type and kind of the pagoda, donor or founder, founding history and reason, dedicated donation, founding purpose, real and faith stories, related historical data, replica of the pagoda and Buddha image, founding year, pagoda location, different beliefs and rituals, measurement of the pagoda, art and architecture, enshrined material, distinguished decorative materials, features, archeological facts, painting, physical description, inscription on the stone, and the bell stone, among others. The most popular pagodas among users are Shwedagon and Kyiktiyo Pagoda, followed by Bagan, Innlya, Rakhine, and Kachine regions. In universities, users search for data and information in the Myanmar language. Tourist guides visit the National Library in Yangon and demand both Myanmar and English language books on pagoda information.

The findings also suggested that the available retrieval tools in libraries include accession books, registration books, and card catalogs. Accession books are used by library staff to keep track of the library’s inventory. Registration books contain information about scholarly works like theses and dissertations, but searching through them can be time-consuming for users. Academic libraries usually organize their collections by subject or department. Libraries use either a card catalog or an electronic catalog to help users find information. Card catalogs can benefit both the library and the user.

Table 2 provides results of a quantitative data analysis conducted through questionnaires on demands for pagoda data and related issues. The findings show that the most requested pagoda information is about the well-known pagodas located in Bagan, accounting for 54.4% of the responses. Other pagodas in Bagan accounts for 22.8%, while local pagodas have a share of 8.8%. The remaining 14.0% is for other unspecified pagodas. The analysis further highlights that both the whole country and western Myanmar have the same percentage of 40.4% regarding the most requested pagoda’s location, which is the highest among the options. Central Myanmar has a lower percentage of 19.2%. The third question inquired about the demand for pagoda information on various aspects, such as history, design, faith, and other unspecified categories. The results indicate that users demand infor-

**Table 2.** Demands for pagoda data and related issues

Demands for pagoda data	Percentage
<b>Requested pagoda information</b>	
Well-known pagodas (Bagan)	54.4
Other pagodas (Bagan)	22.8
Local pagodas	8.8
Others	14.0
<b>Most requested users’ location</b>	
The whole country	40.4
Central Myanmar	19.2
Western Myanmar	40.4
<b>Demand for pagoda information</b>	
Pagoda history	49.2
Design	14.0
Faith	17.5
Most Powerful Mantra and Chanting	3.5
All	8.8
Other	7.0
<b>Library concerns about pagoda information resources</b>	
Insufficient books	52.7
Missing shelves and lack of an electronic retrieval system	17.6
Not electronic retrieval system	7.0
Others	22.7

mation about pagoda history (49.2%), design (14.0%), and faith (17.5%). The demand for “All” pagoda information (8.8%) is lower, while “Most Powerful Mantra and Chanting” has the lowest demand (3.5%). Additionally, 7.0% of respondents expressed a demand for “Other” types of pagoda information. The last section of the table discusses the concerns of the library regarding pagoda information resources, where the library’s primary drawback is the insufficiency of books, accounting for 52.7% of the responses. The next concern is missing shelves and a lack of electronic retrieval systems (17.6%), followed by a non-electronic retrieval system (7.0%). The remaining 22.7% refers to other minor issues that are not consistent.

In conclusion, the findings of this study suggest that the library should update its collection and invest in electronic retrieval systems to address the identified concerns. Additionally, it is crucial to consider user requests for a broader range of pagoda-related resources beyond the library’s

existing collection. These measures would enhance the library's ability to meet the demands of its users effectively.

#### 6.4. Metadata Requirements for Pagoda Data Management

It is also important to note that metadata should be available in both Myanmar and English languages, as both locals and tourists use the pagoda retrieval system. The metadata should also be regularly updated to ensure that it remains accurate and relevant. The National Libraries, in collaboration with the Department of Archaeology and National Museum, should be responsible for managing and updating the metadata to ensure consistency and accuracy across all libraries.

There are various names used for pagodas, including official names, well-known names, and nicknames. It is recommended that all these names be included in the metadata for pagodas. The National Library (Yangon) and Yenangyaung University Library suggested that the National Libraries should be responsible for managing the pagoda metadata. One suggestion is for the National Library to collaborate with the Yangon University Library. It is also appropriate for UCL to have management control of the pagoda metadata because it has the authority to collaborate with other Myanmar university libraries for data entry and other related activities. This would ensure that pagoda data from across the country is included in the metadata.

From the library users' perspective, metadata should include history, architecture, structure, and design. The Department of Archaeology and National Museum should be responsible for managing and retaining this metadata. All libraries participating in the study require training for data entry, as they are concerned about issues related to data entry and processing, such as errors, maintenance costs, licensing fees, annual service charges, and technical errors. Library staff must have both computer skills and knowledge about pagodas, and the department head must be informed before any data entry. However, respondents agree that metadata should not include oral histories or pagoda income, donation money, materials, and expenditures. Only 25.0% of annual income and outcome data from quantitative surveys should be included in the metadata. There is no information about whether the government or the Department of Archaeology will make pagoda data available online. Respondents have not seen all Myanmar pagodas included on the website.

In the metadata, the pagoda retrieval system should offer both "simple search" and "advanced search" to help all

users who will have varying skills and experience in dealing with pagoda data. Those who have limited experience can conduct their searches at a basic level. The user types the words "pagoda name" and "location" in the search box, presses enter, and then their queries will be processed. Advanced search key words are official name, well-known name, period, subject heading (Bristow & Farrar, 2014), content summary, and related history, hidden legends and stories, primary history, related historic, archaeological data, images, and related writing materials. The majority of users describe the specific information they want, the type of information they seek, and their intended use. Hence, they can easily search what they want, although in some cases a pagoda has many different names. Occasionally, the user may know the pagoda's content, but they may or may not know the keywords to use or where to begin their search. They only know the name of the pagoda.

Users have normally not utilized the publisher or pagoda trustee name to search for pagoda data. Typically, academics first go to the university library and search for information in both the departmental library and the main university library. They may also consider visiting a pagoda bookshop, which may have information written by various authors. If they cannot find the information they need, they will then go to the National Libraries in Yangon and Nay Pyi Taw, which house a comprehensive collection of published materials in Myanmar. These libraries also have a vast collection of well-known English books on Myanmar that provide unique information.

The retrieval tools should provide users with information and suggestions that can lead to other similar works. An advanced search option would be helpful, and it should be possible to link and display the full data. Related works could include:

- Similar or related stories at other pagodas
- Other pagodas with the same name in different locations
- Pagodas from the same period (date)

Table 3 provides a comprehensive summary of both quantitative and qualitative findings related to the information required for pagodas in Myanmar libraries to develop metadata. The information presented in this table is crucial for Myanmar libraries to enhance metadata development efforts. The information was categorized into three subject areas: (1) general information, (2) location, and (3) building structure, architecture, painting, and arts. The general information subject area includes important

**Table 3.** Quantitative and qualitative findings of pagoda information for metadata development

Subject area	Specific information
General information	Name of the pagoda, common name, background story and history, founding year, donor, location, pagoda data written in Pali, Mon, or Pyu language Enshrined material and decorated valuable jewelry, Buddha footprints and relics data, and archeology and tourist attraction facts
Location	Pagoda in Rakhine State, Innlay Lake, Kachin Region, Shwedagon, Bagan, regional pagoda data
Building structure, architecture, painting, and arts	Pagoda type, design by period and regional design, characteristics and features, measurements

**Table 4.** Respondents' concerns about Myanmar pagoda metadata

Statement	Percentage				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Myanmar pagoda metadata would be useful for the library	0.0	0.0	3.5	52.6	43.9
This metadata assists in the promotion of library resources, services, and library activities	0.0	0.0	7.0	64.9	28.1
Metadata helps in promoting library services and activities	0.0	0.0	10.5	63.2	26.3
The metadata facilitates learning, teaching, research, and visiting	0.0	0.0	7.0	64.9	28.1
It should include history, design, and belief	0.0	0.0	3.5	66.7	29.8
It supports the library retrieval process	0.0	0.0	8.8	63.2	28.1
It should be maintained collaboratively by university library staff	0.0	0.0	7.0	61.4	31.6
Myanmar's Department of Archeology and National Museum should manage and maintain it	0.0	3.5	7.0	43.9	45.6
It is a new format for Myanmar pagoda data	0.0	0.0	7.0	59.6	33.3
Metadata entry is a critical issue for library staff due to lack of experience	0.0	3.5	33.3	50.9	12.3
There should be a metadata development policy	0.0	0.0	12.3	63.2	24.6
The spiritual belief should be included in the metadata	12.3	54.4	17.5	14.0	1.8

details such as the name of the pagoda, its common name, background story, and history, founding year, donor, location, and language of the written data. The location subject area provides insight into the various locations of pagodas, while the building structure, architecture, painting, and arts subject area contains details about the pagoda type, design by period and regional design, characteristics and features, and measurements.

The results presented in Table 4 were from a survey that aimed to determine the usefulness and potential issues related to developing metadata for Myanmar pagodas. The table displays the statistical frequency of responses to various statements in the questionnaire, indicating the percentage of respondents who strongly disagreed,

disagreed, were neutral, agreed, or strongly agreed with each statement. The findings suggested that over 50.0% of respondents agreed or strongly agreed that Myanmar pagoda metadata would be useful for the library, and that metadata could assist in promoting library resources, services, and activities. Furthermore, 66.7% of respondents believed that pagoda metadata should include information about the history, design, and belief associated with the pagodas. However, it is noteworthy that the inclusion of spiritual beliefs in the metadata was not favored by the majority of respondents, with 54.4% disagreeing with this statement. Additionally, while the majority of respondents preferred collaborative maintenance of the metadata by university library staff, rather than Myanmar's Depart-

ment of Archeology and National Museum, some respondents disagreed with this preference. The survey findings indicate that the respondents recognized the potential benefits of metadata development for Myanmar pagodas, including facilitating learning, teaching, research, and visiting. The survey also highlighted the need for a metadata development policy to ensure consistency and standardization in metadata creation.

## 7. CONCLUSION

This study identified four main challenges in the management of pagoda data in libraries in Myanmar, including difficulties in finding information on the open shelf system, lack of online access, insufficient storage, and the need for visitors to physically go to the library to get data. The Pagoda Data System of the Myanmar Archeology Department and National Museum plays a crucial role in preserving and conserving pagodas in Myanmar, but the lack of widely published research papers limits knowledge dissemination and prevents further research. To address these issues, this study suggests using metadata in both Burmese and English languages to improve the storage, retrieval, and organization of pagoda data documentation. The metadata should be updated regularly and contain information about famous pagodas. The National Library, Department of Archaeology, and National Museum should work together to update metadata to ensure library uniformity and correctness.

Based on the findings of the research, it appears that there are several challenges facing library users and librarians in accessing and managing Myanmar pagoda data. The libraries face challenges in retrieving and storing pagoda data due to limited stocks and retrieval tools. This makes it difficult for librarians to manage this information and provide access to users. Library users may have difficulty accessing all of the available pagoda data easily online. This can make it challenging to research and understand the cultural significance of Myanmar pagodas. Users desire to secure unrestricted access to the pagoda data for academic libraries. Currently, the arrangement of the books on the shelf is convenient, but they all want to get Myanmar pagoda metadata. The National Library can only transition to an online library system, but it is still facing financial and technological challenges. Another staff member is concerned about the pagoda metadata because of their past negative experiences with library software that needs to be updated, cannot be accessed with library computers or electronic devices, and requires

high-speed Internet. However, the national museum is responsible for managing this metadata. This is due to government organizations' limited freedom and a lack of library staff with information literacy skills. According to research findings, there is no centralized database or repository for retrieving and storing pagoda data. To manage a set of pagoda data, libraries must establish certain metadata criteria to assist users in finding and accessing relevant data. Overall, it is clear that there is a need for better management of Myanmar pagoda data in libraries. Improving access to technology and developing metadata can all help to address these challenges. By ensuring that accurate information is available and accessible to library users, we can better understand and appreciate the cultural significance of Myanmar pagodas.

The scope of this study was constrained to qualitative research conducted at seven university libraries and the National Library in Yangon, along with quantitative research carried out at MALC member libraries and national libraries. Consequently, the data collected only reflected the perspectives and practices of national and academic libraries in Myanmar pertaining to pagoda data management. Furthermore, the study did not incorporate the viewpoints and practices of other types of libraries, including public libraries, self-funded community libraries, and other special libraries which could be involved with pagoda data management in the future.

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## CONFLICTS OF INTEREST

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

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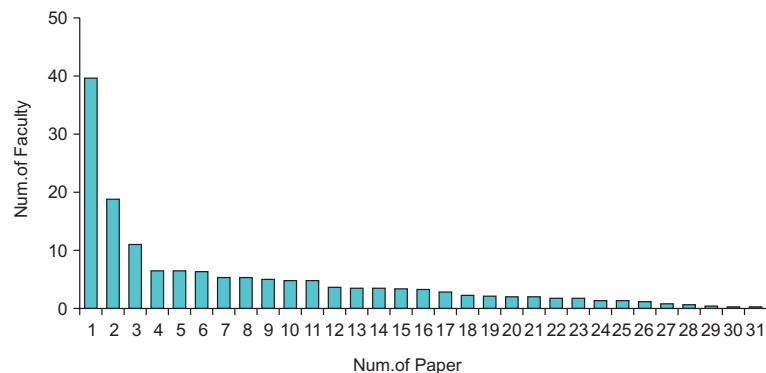
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### Figure



**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
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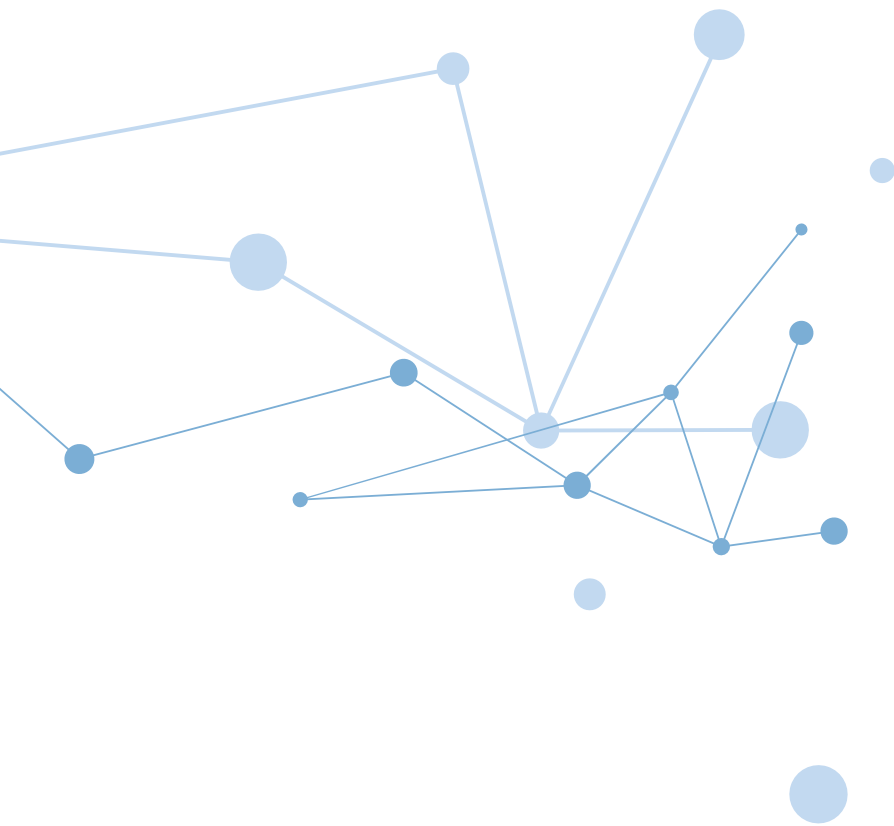
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