A Study on the Applicability and Perception Differences of Blockchain Technology in Academic Libraries

Ho-Won Kim*, Younghee Noh**, Jeong-won Roh***

ARTICLE INFO

Article history:
Received 14 March 2025
Accepted 24 March 2025

Keywords:
Blockchain, university libraries, digital rights management (DRM), technology adoption, organizational readiness, perception differences, technology acceptance

ABSTRACT

Purpose: This study investigates the impact of blockchain technology on university library management, focusing on perception differences between library professionals and administrators. It aims to explore how factors such as organizational readiness, technical feasibility, adoption barriers, and perceived usefulness affect adoption intentions, particularly in the areas of resource management and digital rights management (DRM).

Method : A quantitative difference analysis was conducted using survey data from library practitioners and administrators. Key variables included perceived usefulness, technological benefits, ease of adoption, adoption barriers, and organizational readiness.

Findings: Respondents who found blockchain useful for DRM and resource management also rated its technical benefits and ease of adoption more highly. However, perceptions of organizational readiness were low across all groups, indicating concerns over policy support and infrastructure.

Implications: For successful blockchain adoption, libraries must strengthen institutional readiness through policy development, infrastructure investment, and staff training. The study offers practical insights for advancing blockchain-based innovations in academic library services.in blockchain-based library innovation.

1. Introduction

In recent years, blockchain technology has garnered significant attention as an innovative solution that ensures data security and integrity, leading to its widespread adoption across various industries (Adel & Younis, 2021; Angelis & Da Silva, 2019). Its application has been extensively explored

* Ph.D. candidate in Library and Information Science at Konkuk University (hwonidot@gmail.com) (First Author)
** Professor, Department of Library & Information Science, Konkuk University, Korea (irs4u@kku.ac.kr) (Corresponding Author)
***Ph.D. candidate in Library and Information Science at Konkuk University (njw3227@naver.com) (Co-Author)
International Journal of Knowledge Content Development & Technology, 15(3): 91-122, 2025.
http://dx.doi.org/10.5865/IJKCT.2025.15.3.091

in fields such as finance, healthcare, and supply chain management (SCM), while emerging service models utilizing blockchain are also being introduced in libraries and information institutions (Kushwaha & Singh, 2021; Nicholson, 2017). By providing a decentralized data management system, blockchain technology holds the potential to revolutionize multiple aspects of library operations, including resource management, digital rights management (DRM), and the security of lending and user activity records (Bhatia, Douglas, & Most, 2020; Sicilia & Visvizi, 2018).

Despite its promising applications in the library sector, empirical research on the adoption readiness and acceptance of blockchain technology among university library practitioners and administrators remains limited (Chen, 2020; Dehghani et al., 2022). As digital transformation accelerates within university libraries, analyzing the impact of blockchain adoption on library operations and service quality has become a crucial academic and practical concern (Hoy & Brigham, 2017; Wang et al., 2019). Given the structural characteristics of university libraries and the challenges associated with adopting new information technologies, it is imperative to examine how practitioners perceive the feasibility, ease of adoption, and potential obstacles associated with blockchain technology (Prewett, Prescott, & Phillips, 2020).

Accordingly, this study aims to empirically investigate how university library practitioners and administrators perceive blockchain technology and its relationship with key adoption factors, including organizational readiness, technological factors, perceived barriers, ease of implementation, perceived usefulness, and adoption intention. Through this analysis, the study seeks to provide strategic insights for the effective implementation of blockchain technology in university libraries while offering practical recommendations to enhance technology acceptance within library organizations.

2. Literature Review

Blockchain technology has been increasingly recognized as a transformative solution due to its security, data integrity, and smart contract functionalities, with growing discussions on its potential adoption in libraries and information institutions (Adel & Younis, 2023; Angelis & Da Silva, 2019). This section reviews existing research on blockchain technology, focusing on its conceptual foundations, adoption factors, and applicability in libraries and information institutions, while highlighting the distinct contributions of this study.

The adoption of blockchain technology across various domains has been examined within the framework of information systems (IS) and technology acceptance models (TAM, Technology Acceptance Model) (Davis, 1989; Tornatzky & Fleischer, 1990). Specifically, the key determinants of blockchain adoption are closely linked to organizational, technological, and environmental factors, which are also applicable in the library sector (Dehghani et al., 2022).

Major factors influencing blockchain adoption include organizational readiness, technological complexity, cost-effectiveness, and security (Kumar Bhardwaj et al., 2021). Prior research has also indicated that the successful adoption of blockchain technology depends on critical success factors in information systems (DeLone & McLean, 2003, 2004). Additionally, the transparency and reliability of blockchain technology have been found to enhance the efficiency of information management,

which has prompted discussions on its applicability in library settings (Prewett, Prescott, & Phillips, 2020).

Studies on the application of blockchain in libraries and information institutions have primarily focused on its role in data security, information integrity, and digital rights management (DRM) (Bhatia, Douglas, & Most, 2020; Kushwaha & Singh, 2021). Blockchain technology has been proposed as a solution to address the limitations of traditional integrated library systems (ILS) and can facilitate the automation of book lending and return processes through smart contracts (Hoy & Brigham, 2017). In particular, blockchain has been considered a viable approach for enhancing user privacy and protecting borrowing records, ensuring a higher level of security for library patrons (Hasan & Salah, 2019).

Nicholson (2017) suggested that blockchain-based library systems could establish a more reliable information management structure by leveraging distributed ledger technology (DLT) to strengthen the security of information retrieval and document authentication systems. Similarly, Casino, Dasaklis, and Patsakis (2019) argued that blockchain technology has significant potential for record management and digital rights protection, enhancing the reliability of digital resources in libraries.

Despite the advantages of blockchain in improving transparency in library operations, studies have also identified key challenges, including high implementation costs, infrastructure constraints, and the need for technical adaptation by librarians and users (Kushwaha & Singh, 2021). These findings indicate that both organizational readiness and technological feasibility must be considered to facilitate blockchain adoption in library environments (Chen, 2020).

Most existing studies have focused on the conceptual characteristics and potential applications of blockchain in libraries, particularly in the areas of data security, record management, and digital rights protection (Sicilia & Visvizi, 2018; Nicholson, 2017). However, empirical research that examines differences in perceptions between library practitioners and administrators remains limited. Specifically, few studies have analyzed the relationships between blockchain adoption intentions and demographic factors such as gender, job position, and work experience (Dehghani et al., 2022). To address this research gap, this study empirically analyzes the perceptions of university library practitioners and administrators regarding blockchain adoption. It examines the relationships between blockchain technology and key factors such as organizational readiness, technological determinants, adoption barriers, ease of implementation, perceived usefulness, and adoption intentions. By doing so, this study aims to provide a more concrete understanding of the impact of blockchain technology on university library operations and offers practical and policy recommendations for effective implementation.

Recent studies highlight blockchain's potential across various sectors, including finance (An et al., 2023), scientific research (Lawlor et al., 2024), and academic credentialing (Berrios Moya, 2024). However, most research focuses on commercial or academic settings, with limited attention to libraries. While academic and special libraries may benefit from blockchain in areas such as credential verification and digital preservation, public libraries face challenges due to funding constraints, digital literacy gaps, and their mission of open access. Studies like those of Sharma et al. (2024) and Gupta & Dhillon (2024) identify barriers to adoption, which may be even more pronounced in public institutions. Thus, a critical gap remains in understanding how blockchain can be adapted to different library types. This study addresses that gap by comparing public and

special libraries' needs and exploring blockchain's practical relevance in each context.

3. Research Methodology and Research Questions

3.1 Research Design

This study employs a quantitative research design with a focus on difference analysis to examine the impact of blockchain technology on university library operations and to identify variations in perceptions regarding its adoption. The primary objective is to empirically analyze whether significant differences exist in perceptions of organizational readiness, technological factors, adoption barriers, ease of implementation, perceived usefulness, and adoption intentions based on demographic characteristics (e.g., gender, job position, work experience) and blockchain awareness levels among university library professionals.

To achieve this objective, data were collected through a structured survey, with 87 participants included in the final analysis. The study applied various statistical difference analysis methods to assess group differences and determine how demographic variables (such as gender, job position, and work experience) influence perceptions of blockchain technology and adoption intentions. Additionally, the study explored whether differences exist in organizational readiness, technological factors, ease of implementation, and adoption intentions based on respondents' awareness levels of blockchain technology (e.g., conceptual understanding, awareness of security implications, and perceived applicability in libraries).

Furthermore, based on the findings, this study aims to investigate differences in perceptions regarding the applicability of blockchain technology in library material management and digital rights management (DRM). The following research questions (RQs) were formulated to guide this investigation:

RQ1: Do differences in perceptions of organizational readiness exist based on the level of perceived usefulness of blockchain technology for library material management and digital rights management (DRM)?

RQ2: How does the perception of blockchain technology's impact on library material management and DRM influence the evaluation of technological factors (e.g., system integration feasibility, data security)?

RQ3: Are respondents who perceive blockchain technology as highly useful for material management and DRM less likely to perceive adoption barriers (e.g., cost concerns, technological complexity)?

RQ4: How does the perceived usefulness of blockchain for library material management and DRM influence ease of implementation and adoption intentions?

RQ5: How does organizational readiness (e.g., policy support, IT infrastructure) affect perceptions of blockchain adoption potential for library material management and DRM?

RQ6: How does the perception of blockchain's role in digital rights management influence attitudes toward library operational improvements and innovative service adoption?

By addressing these research questions, this study seeks to systematically analyze the potential impact of blockchain technology on library operations, contributing to the development of practical adoption strategies and future research directions.

3.2 Data Collection and Analysis Methods

This study employed a survey-based quantitative research design to empirically analyze the perceptions and readiness of university library professionals regarding blockchain technology adoption. The research targeted librarians, administrators, IT personnel, and library administrative staff working in university libraries. To ensure that the sample aligned with the study's objectives, a non-probability sampling technique, specifically purposive sampling, was applied. The survey was conducted online, and a total of 87 responses were included in the final analysis.

The survey instrument was designed to measure various factors related to blockchain awareness and adoption, including perceived knowledge of blockchain technology, organizational readiness, technological factors, adoption barriers, ease of implementation, perceived usefulness, and adoption intentions. The blockchain awareness level assessed respondents' understanding of blockchain technology, its potential applications, and its relevance to security. Organizational readiness examined factors such as management support for technology adoption, strategic planning, and IT infrastructure. Technological factors evaluated the feasibility of integrating blockchain into existing library systems, its compatibility with databases, and its ability to ensure data integrity and transparency.

To explore the challenges associated with blockchain adoption, the survey included items related to adoption barriers, measuring concerns regarding technological complexity, cost constraints, and the lack of staff expertise. Ease of implementation was assessed by evaluating respondents' perceptions of blockchain integration feasibility and usability in library systems. Perceived usefulness focused on the expected positive impact of blockchain on library operations, while adoption intention measured respondents' willingness to implement blockchain technology within their institutions. All survey items were measured using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

To analyze the collected data, SPSS and R statistical software were used. A range of statistical techniques was applied to examine differences across groups and relationships among key variables.

Initially, descriptive statistics were computed, including the mean and standard deviation for each variable, to capture overall trends in respondents' perceptions. Frequency analysis was performed to describe the demographic characteristics of the sample, including gender, age group, job position, and work experience.

To compare differences between groups, independent t-tests and one-way ANOVA (Analysis of Variance) were employed. The independent t-test was used to assess differences in blockchain awareness based on gender, while one-way ANOVA examined variations in blockchain awareness and adoption intentions across job positions and work experience levels. When statistically significant differences were found, Tukey's HSD (Honestly Significant Difference) test was conducted as a post-hoc analysis to determine which groups differed significantly.

Additionally, non-parametric tests were conducted for variables that did not meet normality assumptions. The Kruskal-Wallis test was used to analyze differences in blockchain awareness among multiple groups, and if significant differences were identified, Dunn's post-hoc test was performed for further pairwise comparisons.

To investigate relationships between categorical variables, Chi-square (χ^2) tests were applied. This method was particularly useful in examining the associations between demographic characteristics and blockchain adoption intentions.

To further explore the relationships between key study variables, Spearman's rank correlation analysis was conducted. This analysis helped identify the strength and direction of associations between blockchain awareness, technological factors, ease of implementation, and adoption intentions.

To assess the magnitude of observed differences, effect size calculations were performed. Cohen's d was used for independent t-tests to determine the practical significance of mean differences, while eta squared (η^2) was computed for ANOVA tests to evaluate the proportion of variance explained by group differences.

A significance level (α) of 0.05 was used as the threshold for statistical significance. Results were considered statistically significant if p-values were less than 0.05. To ensure a robust interpretation of findings, additional statistical indicators, such as F-statistics, mean differences, and standard deviations, were also taken into account.

By employing these rigorous data collection and analysis methods, this study systematically investigates the feasibility and determinants of blockchain adoption in university libraries. The findings are expected to provide valuable policy and practical insights, contributing to the development of strategic implementation frameworks for blockchain-based library services.

Table 1. Survey Structure and Questionnaire Items

Category	세부항목
Demographic Characteristics	Gender / Age / Job Position / Work Experience
Perceived Awareness of Blockchain Technology (Individual Factors)	I am familiar with what blockchain technology is.
	I understand how blockchain can be applied in university libraries.
	I am aware that blockchain technology is related to data security.
	I believe that blockchain technology can be beneficial for library resource management and digital rights management (DRM).
Organizational Readiness	The library's senior management actively supports the adoption of new technologies.
	Our library has a clear strategy for implementing blockchain technology.
	Our library is likely to secure a budget for blockchain adoption.
	The current IT infrastructure in our library is adequately equipped to integrate blockchain technology.
	I believe that policies and guidelines are necessary for the implementation of blockchain technology.
Technological Factors	Blockchain technology can be easily integrated with existing library systems (e.g., digital library systems).
	Blockchain technology can be compatible with the library's database systems.
	The adoption of blockchain will enhance the security of library users' access to resources.
	The implementation of blockchain-based information systems will improve data integrity and transparency.
Barriers to Blockchain Adoption	I believe that blockchain technology will complicate library operations.
	The cost of implementing blockchain technology will be a significant burden.
	Library staff may struggle to understand blockchain technology, making its adoption challenging.

	The current IT infrastructure in our library is insufficient to support blockchain technology.
Ease of Blockchain Implementation	Blockchain technology can be seamlessly integrated with existing library systems.
	Blockchain technology is unlikely to conflict with the library's current information systems.
	A blockchain-based system can be designed to be easily used by library staff.
	A blockchain-powered library system will provide an intuitive user experience (UX) for staff.
Perceived Usefulness of Blockchain Adoption	Blockchain technology will enhance the efficiency of library operations.
	Utilizing blockchain technology will increase the reliability of library resource management.
	Blockchain technology will allow library users to search and access materials more securely.
	Blockchain technology will contribute to reducing operational costs in libraries.
Intent to Adopt Blockchain Technology	If blockchain technology is introduced in the library, I am willing to actively utilize it.
	I believe that the adoption of blockchain technology will improve the overall management of university libraries.
	If our library implements blockchain technology, I am willing to learn and adapt to its use.

4. Results

4.1 Demographic Characteristics

This study analyzed the demographic characteristics of respondents to identify key variables that may influence perceptions and attitudes toward the adoption of blockchain technology in university libraries. The analysis focused on five categories: gender, age, institution type, job position, and work experience. The distribution of each category was examined using frequency (N) and percentage (%).

The results indicate that female respondents accounted for 56.32%, which was higher than the proportion of male respondents (43.68%). This finding reflects the general trend in university and public libraries, where female librarians constitute a majority. It also suggests the need to analyze potential gender-based differences in the perception of blockchain technology adoption.

Regarding age distribution, the largest proportion of respondents fell within the 30–39 age group (34.48%), followed by those aged 50 and above (27.59%), 40–49 years (21.84%), and 20–29 years (16.09%). These results reflect the long-term employment nature of the library profession, where middle-aged and older employees form a significant portion of the workforce. Notably, the fact that 27.59% of respondents were aged 50 or older highlights the necessity of examining generational differences in the adoption of emerging technologies like blockchain.

Institution-wise, 71.26% of respondents were employed in private university libraries, while 28.74% worked in national university libraries. This distribution reflects the dominance of private universities

in the domestic higher education sector. Additionally, it underscores the importance of analyzing differences in technological adoption environments and organizational readiness between national and private university libraries.

In terms of job position, librarians accounted for the majority (60.92%), followed by managerial positions (29.89%). This distribution suggests that frontline library staff are the primary stakeholders in blockchain technology adoption, as they constitute the largest user group. Meanwhile, the relatively high proportion of managerial respondents (29.89%) indicates the need to assess decision-making perspectives regarding technology adoption. Conversely, IT librarians (4.6%) and administrative staff (2.3%) represented a smaller proportion, suggesting that a lack of specialized IT personnel may pose a challenge to blockchain implementation in university libraries.

An analysis of respondents' work experience showed that long-term employees (11 years or more) constituted the majority (52.87%), with specific distributions of 25 years or more (29.89%), 6–10 years (16.09%), and less than one year (1.15%). These findings align with the long-tenured nature of the university library profession. The low proportion of newly hired staff (1.15% with less than one year of experience) suggests that university library organizations may exhibit resistance to the adoption of new technologies. Given this context, examining differences in perceptions of blockchain adoption based on work experience is crucial to understanding potential challenges in implementation. But, this study is limited by a small sample size and an unclear participant selection method.

Table 2. Demographic Characteristics

Category	Subcategory	N	%
Gender	Female	49	56.32
	Male	38	43.68
Age Group	30-39 years	30	34.48
	50 years and above	24	27.59
	40-49 years	19	21.84
	20-29 years	14	16.09
Institution Type	Private University Library	62	71.26
	National University Library	25	28.74
Job Position	Library Staff (Librarian)	53	60.92
	Managerial Staff (Director, Team Leader, etc.)	26	29.89
	IT Librarian	4	4.6
	Library Administrative Staff	2	2.3
	Library Operations and Administrative Support	2	2.3
Average Number of Respondents	11 years or more	46	52.87
	2-5 years	26	29.89
	6-10 years	14	16.09
	Less than 1 year	1	1.15
Mean Age		87	29.41

4.2 Perception of Blockchain Technology Among Academic Librarians

1) General Awareness of Blockchain Technology (Individual Factors)

This study assessed the overall level of awareness and perception of blockchain technology among academic library practitioners and administrators. Four key areas were evaluated: understanding of blockchain concepts, awareness of its potential applications in university libraries, perception of its relevance to data security, and recognition of its potential for digital rights management (DRM). The findings are summarized as follows.

First, when asked "Are you aware of what blockchain is?", 54.02% of respondents indicated a positive level of awareness, with 22.99% responding "Aware" and 31.03% responding "Very well aware". This suggests a relatively high level of understanding of blockchain as a concept (Mean = 3.66, SD = 1.15).

In contrast, when asked "Do you understand how blockchain can be applied in university libraries?", 47.13% of respondents reported "Unaware" (28.74%) or "Not at all aware" (18.39%). This indicates that there is a relatively lower understanding of how blockchain technology can be implemented within academic library systems (Mean = 2.99, SD = 1.49).

Regarding blockchain's connection to data security, the statement "I am aware that blockchain technology is related to data security" received a positive response from 71.26% of respondents, with 34.48% selecting "Aware" and 36.78% selecting "Very well aware". This indicates that the concept of blockchain as a security-enhancing technology is well understood among the respondents (Mean = 3.92, SD = 1.10).

Finally, the statement "I believe blockchain technology can be useful for library resource management and digital rights management (DRM)" was positively rated by 57.47% of respondents, with 24.14% selecting "Aware" and 33.33% selecting "Very well aware". This suggests that there is a moderate level of recognition of blockchain's potential contribution to library digital asset management and copyright protection (Mean = 3.67, SD = 1.21).

These findings highlight that while general awareness of blockchain is relatively high, there remains a significant gap in understanding its specific applications in university libraries. The results indicate the need for targeted training and educational programs to enhance librarians' knowledge of how blockchain can be effectively integrated into academic library operations.

Table 3. General Awareness of Blockchain Technology (Individual Factors)

Category	Not at all aware		Unaware		Neutral		Aware		Very well aware		Mean	SD
	N	%	N	%	N	%	N	%	N	%		
I am aware of what blockchain is.	3	3.45	11	12.64	26	29.89	20	22.99	27	31.03	3.66	1.15

I understand how blockchain can be applied in university libraries.	16	18.39	25	28.74	13	14.94	10	11.49	23	26.44	2.99	1.49
I am aware that blockchain technology is related to data security.	3	3.45	8	9.2	14	16.09	30	34.48	32	36.78	3.92	1.1
I believe blockchain technology can be useful for library resource management and digital rights management (DRM).	3	3.45	15	17.24	19	21.84	21	24.14	29	33.33	3.67	1.21
Average	25	7.19	59	16.95	72	20.69	81	23.28	111	31.90	14.24	1.24

2) Organizational Readiness for Blockchain Adoption in Academic Libraries

This study assessed the organizational readiness of academic libraries for the adoption of blockchain technology by analyzing five key factors. Respondents evaluated the level of support from senior management, the presence of a clear adoption strategy, the likelihood of budget allocation, the adequacy of IT infrastructure, and the perceived necessity for policies and guidelines. The results of the analysis are as follows.

First, when asked whether "Library management (senior administrators) actively supports the adoption of new technology," 65.51% of respondents disagreed, with 34.48% selecting "Strongly disagree" and 31.03% selecting "Disagree." This indicates that a lack of managerial support for technology adoption could serve as a significant organizational barrier (Mean = 2.17, SD = 1.11).

Similarly, when asked whether "Our library has a clear strategy for adopting blockchain technology," an overwhelming 95.4% of respondents disagreed, with 62.07% selecting "Strongly disagree" and 33.33% selecting "Disagree." These results highlight the absence of a structured approach to blockchain adoption (Mean = 1.46, SD = 0.71).

Regarding financial readiness, "Our library is likely to secure funding for blockchain adoption" was met with skepticism, as 89.66% of respondents disagreed, with 62.07% selecting "Strongly disagree" and 27.59% selecting "Disagree." This finding suggests that budget constraints are likely to be a major obstacle to implementation (Mean = 1.52, SD = 0.79).

In terms of IT infrastructure, when asked whether "Our library's IT infrastructure is sufficiently developed to integrate blockchain technology," 90.8% of respondents expressed disagreement, with 56.32% selecting "Strongly disagree" and 34.48% selecting "Disagree." This indicates that inadequate

IT infrastructure remains a significant challenge for blockchain implementation (Mean = 1.59, SD = 0.83).

Finally, when asked whether "Policies and guidelines for blockchain adoption are necessary," 76.01% of respondents agreed, with 22.99% selecting "Agree" and 54.02% selecting "Strongly agree." This reflects a relatively high level of awareness regarding the need for formalized policies and frameworks to support blockchain adoption in libraries (Mean = 4.18, SD = 1.09).

Table 4. Organizational Readiness for Blockchain Adoption in Academic Libraries

Category	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
	N	%	N	%	N	%	N	%	N	%		
Library management (senior administrators) actively supports the adoption of new technology.	30	34.48	27	31.03	17	19.54	11	12.64	2	2.3	2.17	1.11
Our library has a clear strategy for adopting blockchain technology.	54	62.07	29	33.33	2	2.3	1	1.15	1	1.15	1.46	0.71
Our library is likely to secure funding for blockchain adoption.	54	62.07	24	27.59	7	8.05	1	1.15	1	1.15	1.52	0.79
Our library's IT infrastructure is sufficiently developed to integrate blockchain technology.	49	56.32	30	34.48	4	4.6	3	3.45	1	1.15	1.59	0.83
Policies and guidelines for blockchain adoption are necessary.	3	3.45	5	5.75	12	13.79	20	22.99	47	54.02	4.18	1.09
Total Average	190	43.68	115	26.44	42	9.66	36	8.28	52	11.95	10.92	0.91

3) Technological Factors

This study analyzed four key technological factors to assess how effectively blockchain technology can be integrated into existing academic library systems. Respondents evaluated blockchain's potential for system integration, database compatibility, secure user access to resources, and improvements in data transparency and integrity. The analysis yielded the following results.

First, in response to the statement, "Blockchain technology can be easily integrated with the current library systems (e.g., electronic library systems)," 41.38% of respondents selected "Strongly Disagree" or "Disagree," indicating a significant perception of difficulty in technological integration. Conversely, 37.93% of respondents agreed (27.59%) or strongly agreed (10.34%), suggesting a divided perspective on the feasibility of integrating blockchain with library systems (Mean = 2.9, SD = 1.28).

For the statement, "Blockchain technology can be compatible with the library's database system," 70.69% of respondents agreed (33.33%) or strongly agreed (36.78%), demonstrating a generally positive perception regarding blockchain's ability to interface with existing database systems (Mean = 3.64, SD = 1.46).

Regarding the statement, "If blockchain technology is adopted, library users will be able to access resources more securely," 44.83% of respondents agreed (25.29%) or strongly agreed (18.39%), indicating that a considerable portion of participants recognize the potential of blockchain to enhance the security of user access to library resources (Mean = 3.13, SD = 1.35).

Finally, for the statement, "The implementation of a blockchain-based information system will enhance data integrity and transparency," 54.02% of respondents agreed (28.74%) or strongly agreed (25.29%), reinforcing the strong belief that blockchain technology can contribute to increased reliability and transparency of data management (Mean = 3.32, SD = 1.42).

Table 5. Technological Factors

Category	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
	N	%	N	%	N	%	N	%	N	%		
Blockchain technology can be easily integrated with existing library systems (e.g., digital library systems).	15	17.24	21	24.14	18	20.69	24	27.59	9	10.34	2.9	1.28
Blockchain technology can be compatible with the library's database systems.	13	14.94	11	12.64	2	2.3	29	33.33	32	36.78	3.64	1.46

The adoption of blockchain will enhance the security of library users' access to resources.	14	16.09	15	17.24	20	22.99	22	25.29	16	18.39	3.13	1.35
The implementation of blockchain-based information systems will improve data integrity and transparency.	14	16.09	13	14.94	13	14.94	25	28.74	22	25.29	3.32	1.42
Average	56	16.09	60	17.24	53	15.23	100	28.74	79	22.70	12.99	1.38

4) Barriers to Blockchain Adoption

This study identified four key factors that may hinder the adoption of blockchain technology in academic libraries. Respondents evaluated concerns related to increased operational complexity, financial burden, lack of staff technical proficiency, and insufficient IT infrastructure. The analysis yielded the following results.

First, in response to the statement, "I believe blockchain technology will complicate library operations," 41.38% of respondents selected "Strongly Disagree" or "Disagree," indicating that concerns over increased operational complexity were relatively low (Mean = 2.9, SD = 1.28).

Conversely, the statement, "The cost of implementing blockchain technology will be a significant burden," received agreement from 70.69% of respondents, with 33.33% selecting "Agree" and 36.78% selecting "Strongly Agree." This finding suggests that financial constraints are perceived as a major barrier to blockchain adoption (Mean = 3.64, SD = 1.46).

Regarding the statement, "The adoption of blockchain technology will be difficult due to library staff's insufficient understanding of the technology," 44.83% of respondents agreed (25.29%) or strongly agreed (18.39%), indicating that a lack of technical proficiency among staff could serve as a barrier to implementation (Mean = 3.13, SD = 1.35).

Finally, in response to the statement, "Our library's IT infrastructure is insufficient to support blockchain technology," 54.02% of respondents agreed (28.74%) or strongly agreed (25.29%), highlighting that inadequate IT infrastructure is perceived as a critical challenge to adoption (Mean = 3.32, SD = 1.42).

Table 6. Barriers to Blockchain Adoption

Category	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD

	N	%	N	%	N	%	N	%	N	%		
I believe that blockchain technology will complicate library operations.	15	17.24	21	24.14	18	20.69	24	27.59	9	10.34	2.9	1.28
The cost of implementing blockchain technology will be a significant burden.	13	14.94	11	12.64	2	2.3	29	33.33	32	36.78	3.64	1.46
Library staff may struggle to understand blockchain technology, making its adoption challenging.	14	16.09	15	17.24	20	22.99	22	25.29	16	18.39	3.13	1.35
The current IT infrastructure in our library is insufficient to support blockchain technology.	14	16.09	13	14.94	13	14.94	25	28.74	22	25.29	3.32	1.42
Average	56	16.09	60	17.24	53	15.23	100	28.74	79	22.70	12.99	1.38

5) Ease of Blockchain Adoption in Academic Libraries

This study assessed the ease with which blockchain technology could be integrated into academic library systems by analyzing four key factors. Respondents evaluated the feasibility of integration with existing library systems, the likelihood of minimal conflict with current information systems, the usability for library staff, and the potential for an intuitive user experience (UX). The findings are as follows.

First, in response to the statement, "Blockchain technology can be easily integrated with existing library systems," 45.52% of respondents selected "Agree" (27.59%) or "Strongly Agree" (28.74%), indicating a relatively positive perception of blockchain's compatibility with library systems (Mean = 3.32, SD = 1.31).

Conversely, the statement, "Blockchain technology will have minimal conflict with currently used information systems," revealed that 41.38% of respondents selected "Strongly Disagree" (8.05%) or "Disagree" (35.63%), suggesting a higher level of concern regarding technological compatibility with existing systems (Mean = 3.14, SD = 1.39).

Regarding the statement, "Blockchain systems can be designed for easy use by library staff,"

54.03% of respondents agreed (24.14%) or strongly agreed (29.89%), indicating a high level of confidence in the usability of blockchain-based systems for library employees (Mean = 3.47, SD = 1.35).

Finally, in response to the statement, "Library systems utilizing blockchain technology will provide an intuitive user experience (UX) for staff," 59.72% of respondents selected "Agree" (25.29%) or "Strongly Agree" (33.33%), demonstrating a prevalent belief that blockchain-based systems could be designed with a user-friendly interface (Mean = 3.56, SD = 1.24).

Table 7. Ease of Blockchain Adoption in Academic Libraries

Category	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
	N	%	N	%	N	%	N	%	N	%		
Blockchain technology can be seamlessly integrated with existing library systems.	6	6.9	21	24.14	24	27.59	11	12.64	25	28.74	3.32	1.31
Blockchain technology is unlikely to conflict with the library's current information systems.	7	8.05	31	35.63	18	20.69	5	5.75	26	29.89	3.14	1.39
A blockchain-based system can be designed to be easily used by library staff.	9	10.34	14	16.09	17	19.54	21	24.14	26	29.89	3.47	1.35
A blockchain-powered library system will provide an intuitive user experience (UX) for staff.	4	4.6	15	17.24	22	25.29	17	19.54	29	33.33	3.6	1.24
Average	26	7.47	81	23.28	81	23.28	54	15.52	106	30.46	13.53	1.32

6) Usefulness of Blockchain Technology in Academic Libraries

This study evaluated the usefulness of blockchain technology in improving the operations and services of academic libraries by analyzing four key aspects. Respondents assessed its potential

for enhancing work efficiency, increasing the reliability of collection management, improving secure access to information for users, and contributing to cost reduction. The findings are as follows.

First, in response to the statement, "Blockchain technology will enhance the efficiency of library operations," 56.32% of respondents selected "Agree" (25.29%) or "Strongly Agree" (31.03%), indicating a relatively high expectation for improved operational efficiency (Mean = 3.71, SD = 1.09).

Additionally, for the statement, "Utilizing blockchain technology will enhance the reliability of library collection management," 73.56% of respondents chose "Agree" (31.03%) or "Strongly Agree" (42.53%), demonstrating a strong positive perception that blockchain can strengthen the reliability and integrity of library resources (Mean = 3.99, SD = 1.14).

Regarding the statement, "Blockchain technology will enable library users to search and access resources more securely," 67.81% of respondents selected "Agree" (33.33%) or "Strongly Agree" (34.48%), highlighting high expectations for improved information security and data access stability (Mean = 3.83, SD = 1.15).

Finally, in response to the statement, "Blockchain technology will contribute to reducing library operational costs," 54.77% of respondents chose "Agree" (28.74%) or "Strongly Agree" (25.29%), indicating a moderately positive expectation for cost reduction, though this factor received a relatively lower rating compared to the other aspects (Mean = 3.47, SD = 1.21).

Table 8. Usefulness of Blockchain Technology in Academic Libraries

Category	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
	N	%	N	%	N	%	N	%	N	%		
Blockchain technology will enhance the efficiency of library operations.	1	1.15	12	13.79	25	28.74	22	25.29	27	31.03	3.71	1.09
Utilizing blockchain technology will increase the reliability of library resource management.	3	3.45	9	10.34	11	12.64	27	31.03	37	42.53	3.99	1.14
Blockchain technology will allow library users to search and access materials more securely.	4	4.6	9	10.34	15	17.24	29	33.33	30	34.48	3.83	1.15
Blockchain technology will	12	13.79	30	34.48	13	14.94	7	8.05	25	28.74	3.03	1.47

contribute to reducing operational costs in libraries.												
Average	20	5.75	60	17.24	64	18.39	85	24.43	119	34.20	14.56	1.21

7) Willingness to Adopt Blockchain Technology

This study evaluated the willingness of academic library practitioners to adopt blockchain technology by analyzing three key factors: their intention to utilize blockchain, expectations for operational improvements, and willingness to learn and apply the technology. The findings are as follows.

First, in response to the statement, "If blockchain technology is introduced in libraries, I am willing to actively utilize it," 51.72% of respondents selected "Agree" (19.54%) or "Strongly Agree" (32.18%), indicating a relatively high willingness to use blockchain technology in practice (Mean = 3.66, SD = 1.12).

Additionally, for the statement, "I believe the adoption of blockchain technology will improve academic library operations," 53.72% of respondents chose "Agree" (20.69%) or "Strongly Agree" (33.33%), demonstrating a positive expectation that blockchain adoption will enhance operational efficiency (Mean = 3.64, SD = 1.2).

Finally, in response to the statement, "If my library adopts blockchain technology, I am willing to actively learn and apply it," 66.67% of respondents selected "Agree" (28.74%) or "Strongly Agree" (37.93%), indicating a strong inclination among respondents to acquire the necessary knowledge and integrate blockchain technology into library operations (Mean = 3.83, SD = 1.1).

Table 9. Willingness to Adopt Blockchain Technology

Category	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
	N	%	N	%	N	%	N	%	N	%		
If blockchain technology is introduced in the library, I am willing to actively utilize it.			16	18.39	26	29.89	17	19.54	28	32.18	3.66	1.12
I believe that the adoption of blockchain technology will improve the overall management of university libraries.	3	3.45	14	16.09	23	26.44	18	20.69	29	33.33	3.64	1.2

If our library implements blockchain technology, I am willing to learn and adapt to its use.	1	1.15	12	13.79	16	18.39	25	28.74	33	37.93	3.89	1.1
Average	4	2.30	42	16.09	65	24.91	60	22.99	90	34.48	11.19	1.14

8) Analysis of Differences Based on Demographic Characteristics

The results of the analysis indicate that gender-based differences in the perception of blockchain technology were mostly insignificant ($p > 0.05$). However, in the statement "I am aware that blockchain technology is related to data security," the p-value was 0.061, suggesting a tendency for male respondents to have a higher awareness of security-related aspects than female respondents. Nevertheless, overall findings suggest that factors such as job experience, technical background, and age group may have a more substantial impact than gender.

Similarly, no statistically significant differences were observed based on work experience ($p > 0.05$). This finding implies that blockchain technology awareness may be more influenced by individual experiences and background rather than the length of service. Future research should further examine differences by job type and age group to gain a more nuanced understanding of these dynamics.

To assess organizational trends in technology adoption, this study analyzed differences in blockchain technology perception across job positions. The results revealed statistically significant differences in certain items ($p < 0.05$), indicating that attitudes and expectations regarding blockchain adoption varied by job role.

Among different job categories, IT librarians and managerial staff (directors, team leaders) exhibited the highest levels of blockchain awareness. Conversely, administrative staff and general support personnel recorded relatively lower scores. This finding suggests that individuals in technology-related roles are more likely to have a higher understanding of blockchain technology and a more favorable attitude toward adopting new technologies. On the other hand, no significant differences were found in perceptions of organizational readiness and technological factors across job ranks. This suggests a shared recognition of the lack of systematic support for blockchain adoption within the organization.

Regarding the perceived usefulness of blockchain technology, managerial staff and IT librarians expressed strong beliefs that its adoption would positively impact library services. In contrast, administrative and general support staff exhibited more skepticism about the practical effectiveness of the technology. This disparity suggests that job function and the extent of technology utilization influence attitudes toward adoption.

Overall, respondents with a technical background displayed a more positive attitude toward blockchain adoption, while those in non-technical roles exhibited a more cautious stance. These findings underscore the need for position-specific training and organizational support to enhance the effectiveness of technology implementation. To ensure that blockchain technology contributes meaningfully to library operations and service improvement, a strategic approach that considers job-specific technology acceptance levels is essential.

Table 10. Correlation with Job Position

Category	Average for Management-Level Staff	Average for Library Practitioners (Librarians)	Average for Administrative Staff	Average for Library Operations and Administrative Support Staff	Average for IT Librarians	F-Statistic	p-value
Perceived Awareness of Blockchain Technology	4.0	3.6	2.5	1.5	4.3	3.3773	0.0131
	3.3	2.8	1.5	1.5	4.5	2.8054	0.0309
	4.1	3.9	3.0	1.5	4.8	4.0453	0.0048
	4.0	3.5	3.0	1.5	4.8	3.8638	0.0063
Organizational Readiness	2.2	2.2	2.5	2.0	1.5	0.4298	0.7867
	1.5	1.5	1.5	1.5	1.0	0.4328	0.7845
	1.7	1.4	2.0	1.5	1.3	0.7585	0.5553
	1.7	1.5	2.5	1.5	1.0	1.2641	0.2908
	4.5	4.1	2.5	3.5	5.0	2.8884	0.0273
Technological Factors	3.8	3.1	2.5	2.5	4.0	2.2749	0.0681
	4.0	3.4	3.0	2.5	4.8	2.5815	0.0432
	4.2	3.5	3.0	2.5	4.8	3.5773	0.0097
	4.2	3.6	3.0	2.0	4.8	4.4749	0.0025
Barriers to Blockchain Adoption	2.5	3.0	2.5	4.5	2.8	1.5647	0.1915
	3.2	3.9	3.5	5.0	3.0	1.7869	0.1393
	3.0	3.2	2.0	4.0	2.8	0.7619	0.5531
	3.0	3.5	2.0	5.0	2.8	1.8096	0.1348
Ease of Blockchain Implementation	3.8	3.0	3.0	3.0	4.3	2.2051	0.0755
	3.8	2.8	2.5	3.0	4.3	3.6678	0.0085
	3.8	3.3	3.0	2.0	4.3	1.4715	0.2184
	4.0	3.4	3.5	2.0	4.3	2.1848	0.0779
Perceived Usefulness of Blockchain Adoption	4.1	3.5	3.0	3.0	4.3	1.7690	0.1430
	4.3	3.8	3.0	3.0	5.0	2.4801	0.0502
	4.3	3.6	3.0	3.0	4.8	2.8278	0.0299
	3.3	2.9	3.0	2.0	3.8	0.8411	0.5031
Intent to Adopt Blockchain Technology	3.9	3.5	3.0	3.5	4.5	1.2648	0.2906
	3.8	3.5	3.5	3.0	4.8	1.2049	0.3151
	3.9	3.8	4.0	3.0	4.8	0.9523	0.4383

4.3 Analysis of Differences Based on Blockchain Awareness

1) Analysis of Differences According to Blockchain Awareness Level

This study analyzed the differences based on the level of awareness of blockchain technology

("I know what blockchain is") to examine how understanding of blockchain technology influences organizational readiness, technological factors, barriers to adoption, ease of implementation, perceived usefulness, and intent to adopt.

The analysis revealed significant differences between respondents with high awareness of blockchain technology ("strongly agree") and those with low awareness ("strongly disagree") across most factors ($p < 0.05$). In particular, the factors of perceived usefulness ($p = 0.0000$), ease of implementation ($p = 0.0000$), and technological factors ($p = 0.0000$) exhibited the highest F-statistics, indicating the most pronounced differences. These findings suggest that respondents with a higher understanding of blockchain technology tend to evaluate its necessity and benefits more positively.

Conversely, in the organizational readiness category, some items did not exhibit statistically significant differences. This implies that even respondents with a high level of understanding of blockchain technology may remain skeptical about their organization's preparedness for adoption. This finding suggests that despite individual knowledge of blockchain, the actual implementation remains challenging unless there is sufficient institutional support and a well-structured adoption strategy in place.

Additionally, barriers to blockchain adoption ($p = 0.0115$) also showed significant differences based on awareness levels. Respondents with a strong understanding of blockchain technology were less likely to perceive technological complexity or cost burden as significant barriers. This finding indicates that respondents with lower awareness levels are more likely to perceive greater risks associated with blockchain adoption, reflecting a potential gap between technological familiarity and perceived adoption challenges.

Table 11. Analysis of Differences According to Blockchain Awareness Level

Category	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	F-Statistic	p-value
Perceived Awareness of Blockchain Technology (Individual Factors)	5.0	3.0	4.0	2.0	1.0	86.0000	0.0000
	4.7	2.1	2.9	1.6	1.0	55.8158	0.0000
	4.9	3.7	4.1	2.3	2.3	57.4783	0.0000
	4.8	3.3	3.7	2.2	2.0	48.5105	0.0000
Organizational Readiness	1.5	2.7	2.4	1.9	2.7	22.0545	0.0002
	1.4	1.5	1.6	1.4	1.3	1.5906	0.8105
	1.4	1.7	1.6	1.5	1.0	4.3680	0.3585
	1.5	1.8	1.6	1.5	1.3	3.0156	0.5552
	4.7	4.2	4.2	3.0	3.3	15.9862	0.0030
Technological Factors	4.5	2.6	3.2	2.6	3.0	34.4387	0.0000
	4.6	3.2	3.3	2.8	3.0	30.0906	0.0000
	4.6	3.5	3.5	2.8	3.0	28.0780	0.0000
	4.6	3.6	3.8	2.9	2.3	30.2720	0.0000
Barriers to Blockchain Adoption	2.2	3.3	3.0	3.2	4.0	12.9634	0.0115
	2.3	4.4	3.9	4.2	5.0	26.5214	0.0000

	2.3	3.5	3.2	3.9	4.0	16.9227	0.0020
	2.3	3.8	3.8	3.9	3.7	18.3313	0.0011
Ease of Blockchain Implementation	4.6	2.7	3.0	2.5	2.7	34.1323	0.0000
	4.4	2.5	2.8	2.4	2.7	29.7948	0.0000
	4.5	2.9	3.3	3.2	2.0	29.4370	0.0000
	4.6	3.3	3.2	3.2	1.7	28.7209	0.0000
Perceived Usefulness of Blockchain Adoption	4.6	3.2	3.6	3.2	2.7	33.2944	0.0000
	4.6	3.9	3.9	3.3	3.3	21.4770	0.0003
	4.6	3.6	3.6	3.4	2.7	26.6047	0.0000
	4.4	2.3	2.8	2.5	1.3	31.5232	0.0000
Intent to Adopt Blockchain Technology	4.6	3.2	3.6	3.0	2.7	29.4862	0.0000
	4.5	3.2	3.5	3.0	3.0	25.8181	0.0000
	4.6	3.6	3.9	3.1	3.0	25.0816	0.0000

2) Analysis of Differences Based on Blockchain Utilization Awareness

This study analyzed the differences in organizational readiness, technological factors, adoption barriers, ease of adoption, perceived usefulness, and intention to adopt based on the level of awareness regarding the statement: "I understand how blockchain can be utilized in university libraries."

The results indicated statistically significant differences ($p < 0.05$) in most factors between the group with high awareness ("Strongly Agree") and the group with low awareness ("Strongly Disagree"). Notably, technological factors ($p = 0.0000$), perceived usefulness of blockchain technology ($p = 0.0000$), and intention to adopt ($p = 0.0000$) exhibited the highest F-statistics, demonstrating that individuals with a higher understanding of blockchain utilization tend to evaluate the necessity and effectiveness of adoption more positively.

On the other hand, while significant differences were observed in organizational readiness, the effect size was relatively lower ($p = 0.0145 \sim 0.0180$). This suggests that although respondents with a higher understanding of blockchain technology positively assess its potential, they still perceive limitations in organizational preparedness and support. In other words, a high level of awareness about blockchain technology does not automatically lead to a positive evaluation of the organization's readiness for adoption.

Additionally, significant differences were found in the adoption barriers category ($p = 0.0005$), indicating that respondents with greater awareness of blockchain utilization tend to perceive fewer adoption challenges. This suggests that individuals with lower levels of awareness are more likely to express concerns about implementation costs, technical complexity, and system integration issues compared to those with higher awareness.

Table 12. Analysis of Differences Based on Blockchain Utilization Awareness

Category	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	F-Statistic	p-value

Perceived Awareness of Blockchain Technology (Individual Factors)	5.0	2.5	3.6	3.1	3.9	57.2098	0.0000
	5.0	1.0	3.0	2.0	4.0	86.0000	0.0000
	5.0	3.1	3.9	3.3	4.3	48.5013	0.0000
	5.0	2.2	3.8	3.0	4.4	66.4554	0.0000
Organizational Readiness	1.4	2.2	2.2	2.8	2.2	24.3770	0.0001
	1.4	1.1	1.9	1.5	1.5	12.4246	0.0145
	1.4	1.1	1.8	1.7	1.5	11.5114	0.0214
	1.5	1.2	1.9	1.8	1.5	11.9118	0.0180
	5.0	3.3	3.8	4.1	4.5	30.3963	0.0000
Technological Factors	4.9	2.4	2.5	2.8	3.8	53.7700	0.0000
	4.9	2.6	3.0	3.1	4.1	49.4984	0.0000
	4.9	2.6	3.3	3.3	4.3	49.6952	0.0000
	5.0	2.8	3.3	3.5	4.3	52.7629	0.0000
Barriers to Blockchain Adoption	1.9	3.5	3.4	3.3	2.7	22.9988	0.0001
	2.0	4.5	4.1	4.4	3.6	30.9589	0.0000
	2.1	3.9	3.2	3.5	3.3	19.8204	0.0005
	1.9	4.0	3.6	3.9	3.6	26.7312	0.0000
Ease of Blockchain Implementation	5.0	2.3	2.8	2.7	3.3	50.8844	0.0000
	5.0	2.1	2.3	2.5	3.2	51.3183	0.0000
	5.0	2.2	2.6	3.4	3.4	52.7639	0.0000
	5.0	2.5	3.0	3.5	3.3	46.4750	0.0000
Perceived Usefulness of Blockchain Adoption	5.0	2.8	3.2	3.4	3.8	49.2172	0.0000
	5.0	3.1	3.2	3.8	4.5	46.2935	0.0000
	5.0	3.0	3.2	3.4	4.3	51.7483	0.0000
	4.9	1.8	2.5	2.4	3.2	51.7295	0.0000
Intent to Adopt Blockchain Technology	5.0	3.1	3.1	3.0	4.1	51.0995	0.0000
	5.0	2.9	3.2	3.0	4.1	48.5593	0.0000
	5.0	3.4	3.2	3.4	4.4	43.5398	0.0000

3) Analysis of Differences Based on Blockchain Security Awareness

This study examined the differences in organizational readiness, technological factors, adoption barriers, ease of adoption, perceived usefulness, and intention to adopt based on respondents' level of awareness regarding the statement: "I am aware that blockchain technology is related to data security."

The results revealed statistically significant differences ($p < 0.05$) in most factors between the group with high security awareness ("Strongly Agree") and the group with low security awareness ("Strongly Disagree"). In particular, technological factors ($p = 0.0000$), perceived usefulness of blockchain technology ($p = 0.0000$), and intention to adopt ($p = 0.0002$) exhibited the highest F-statistics, indicating a strong correlation between perceptions of blockchain security and its practical utility. This suggests that individuals who recognize blockchain's security potential are more likely

to assess its adoption as beneficial and feasible.

However, in the organizational readiness category, no significant differences were observed in certain items ($p = 0.0566$, $p = 0.4328$, $p = 0.0540$). This finding implies that a high level of security awareness does not necessarily translate into a positive evaluation of an organization's readiness for adoption. In other words, while respondents may acknowledge blockchain's security advantages, they do not automatically perceive their organizations as being adequately prepared in terms of policy or technical infrastructure.

Additionally, significant differences were found in adoption barriers ($p = 0.0037$), indicating that respondents with higher security awareness tend to perceive fewer challenges to blockchain adoption. This suggests that individuals who strongly recognize blockchain's security benefits are less likely to view technical complexities and cost constraints as major obstacles, highlighting the role of security perceptions in shaping attitudes toward adoption.

Table 13. Analysis of Differences Based on Blockchain Security Awareness

Category	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	F-Statistic	p-value
Perceived Awareness of Blockchain Technology (Individual Factors)	4.7	3.6	2.6	2.5	1.7	55.8916	0.0000
	4.3	2.7	1.8	1.6	1.3	43.9267	0.0000
	5.0	4.0	3.0	2.0	1.0	86.0000	0.0000
	4.7	3.6	2.9	2.1	1.7	50.7124	0.0000
Organizational Readiness	1.7	2.5	2.7	1.9	2.3	13.9603	0.0074
	1.4	1.7	1.4	1.3	1.0	9.1881	0.0566
	1.4	1.7	1.4	1.4	1.7	3.8068	0.4328
	1.4	1.9	1.5	1.3	1.7	9.3025	0.0540
	4.7	4.2	3.6	3.3	4.0	17.8729	0.0013
Technological Factors	4.1	3.1	2.7	2.6	3.3	16.8292	0.0021
	4.3	3.4	3.1	2.4	3.3	22.3198	0.0002
	4.5	3.5	3.1	2.6	3.3	30.0846	0.0000
	4.5	3.8	3.0	2.8	3.0	34.6598	0.0000
Barriers to Blockchain Adoption	2.4	3.2	3.0	3.0	4.0	9.4481	0.0508
	2.8	3.9	4.6	4.1	4.3	12.2153	0.0158
	2.4	3.3	3.7	3.8	4.3	15.5337	0.0037
	2.6	3.6	3.9	4.1	4.0	11.8360	0.0186
Ease of Blockchain Implementation	4.3	2.9	2.6	2.6	2.3	27.6094	0.0000
	4.2	2.6	2.6	2.3	2.3	25.5557	0.0000
	4.1	3.3	2.9	3.0	2.3	16.9497	0.0020
	4.3	3.4	3.0	3.0	2.7	18.8520	0.0008
Perceived Usefulness of Blockchain Adoption	4.4	3.4	3.4	2.9	3.7	23.5561	0.0001
	4.5	3.9	3.6	3.1	3.7	23.8379	0.0001
	4.4	3.6	3.4	3.1	3.7	25.4449	0.0000
	3.9	2.7	2.5	2.1	2.0	15.8704	0.0032

Intent to Adopt Blockchain Technology	4.4	3.4	3.0	2.9	3.7	25.5272	0.0000
	4.3	3.4	3.1	2.8	3.3	21.1909	0.0003
	4.5	3.8	3.4	3.0	3.7	22.4559	0.0002

4) Analysis of Differences Based on Perceived Usefulness of Blockchain for Library Resource Management and Digital Rights Management (DRM)

This study examined the differences in organizational readiness, technological factors, adoption barriers, ease of adoption, perceived usefulness, and intention to adopt based on respondents' level of agreement with the statement: "I believe blockchain technology can be useful for library resource management and digital rights management (DRM)."

The results indicated statistically significant differences ($p < 0.05$) in most factors between the group with high perceived usefulness of blockchain for DRM ("Strongly Agree") and the group with low perceived usefulness ("Strongly Disagree"). In particular, technological factors ($p = 0.0000$), perceived usefulness of blockchain technology ($p = 0.0000$), and intention to adopt ($p = 0.0000$) exhibited the highest F-statistics, demonstrating a strong correlation between positive perceptions of blockchain's role in resource and copyright management and the recognition of its necessity and applicability. This suggests that individuals who acknowledge blockchain's potential for DRM are more likely to evaluate its adoption as essential and feasible.

However, in the organizational readiness category, some items did not show significant differences ($p = 0.4936$, $p = 0.5187$, $p = 0.5610$). This finding implies that even respondents who recognize the potential of blockchain for DRM remain cautious about their organizations' preparedness for its adoption. In other words, while respondents may acknowledge the technological feasibility of blockchain, they perceive a gap between technical potential and actual organizational capacity for implementation. This result underscores the necessity of institutional support and policy-driven preparation to ensure the practical adoption of blockchain technology.

Additionally, significant differences were observed in adoption barriers ($p = 0.0009$), indicating that respondents with higher perceived usefulness of blockchain for DRM tend to perceive fewer obstacles to adoption. This suggests that individuals who strongly recognize blockchain's advantages for resource management and copyright protection are less likely to be concerned about barriers such as cost constraints and system integration challenges. These findings highlight the critical role of perceived benefits in shaping attitudes toward the feasibility of blockchain adoption in libraries.

Table 14. Analysis of Differences Based on Perceived Usefulness of Blockchain for Library Resource Management and Digital Rights Management (DRM)

Category	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	F-Statistic	p-value
Perceived Awareness	4.7	2.7	3.7	3.2	1.7	47.6381	0.0000

of Blockchain Technology (Individual Factors)	4.7	1.5	3.0	1.9	1.0	66.7132	0.0000
	4.9	2.9	3.9	3.6	1.7	54.8856	0.0000
	5.0	2.0	4.0	3.0	1.0	86.0000	0.0000
Organizational Readiness	1.8	2.2	2.3	2.6	1.7	9.9381	0.0415
	1.5	1.3	1.6	1.5	1.0	3.3974	0.4936
	1.6	1.3	1.6	1.5	1.0	3.2385	0.5187
	1.6	1.5	1.7	1.6	1.0	2.9812	0.5610
	4.9	3.2	4.3	3.9	2.7	30.5855	0.0000
Technological Factors	4.5	2.6	3.1	2.6	2.7	34.8036	0.0000
	4.6	2.6	3.5	2.9	3.3	38.3933	0.0000
	4.8	2.7	3.6	3.2	2.7	49.9989	0.0000
	4.9	2.9	3.6	3.3	2.7	51.5549	0.0000
Barriers to Blockchain Adoption	2.1	3.5	3.0	3.4	3.7	19.5118	0.0006
	2.5	4.5	3.9	4.3	4.3	18.7016	0.0009
	2.4	3.9	3.0	3.6	5.0	21.2359	0.0003
	2.3	3.9	3.5	3.9	4.7	21.5064	0.0003
Ease of Blockchain Implementation	4.5	2.6	3.0	2.5	2.3	37.2818	0.0000
	4.5	2.3	2.7	2.4	2.0	40.6958	0.0000
	4.5	2.8	3.3	2.8	2.7	31.2186	0.0000
	4.5	2.9	3.5	2.9	2.7	30.2765	0.0000
Perceived Usefulness of Blockchain Adoption	4.6	2.8	3.7	3.2	3.7	36.0236	0.0000
	4.9	3.0	3.8	3.6	3.7	44.9182	0.0000
	4.9	3.0	3.7	3.1	3.7	48.5520	0.0000
	4.3	2.0	2.9	2.2	2.7	32.3350	0.0000
Intent to Adopt Blockchain Technology	4.6	2.8	3.4	3.1	4.0	37.4650	0.0000
	4.6	2.8	3.5	2.9	3.7	35.6880	0.0000
	4.7	2.8	3.8	3.5	4.0	37.0860	0.0000

5. Discussion

This study analyzed the impact of blockchain technology on library resource management and digital rights management (DRM), examining its relationship with organizational readiness, technological factors, adoption barriers, ease of adoption, perceived usefulness, and intention to adopt. The following section discusses the key findings in relation to the research questions (RQs).

1) Relationship Between Perceived Usefulness of Blockchain and Organizational Readiness (RQ1, RQ5)

This result directly addresses RQ1 and RQ5 by demonstrating that the perceived usefulness of blockchain does not necessarily translate into a belief in institutional readiness, highlighting the gap between user perception and organizational capacity.

The findings indicate that respondents who perceived blockchain technology as useful for library resource management and DRM tended to evaluate their organization's readiness (e.g., policy support,

technical infrastructure) less favorably. This suggests that while respondents acknowledge the utility of blockchain, they believe that library organizations are not sufficiently prepared to adopt it. This finding aligns with previous studies that emphasize the critical role of organizational support and policy frameworks in the successful adoption of emerging technologies (DeLone & McLean, 2003; Hoy & Brigham, 2017). It underscores the need for legal and institutional support to facilitate the practical application of blockchain technology in libraries.

These results are also consistent with the study by Kushwaha & Singh (2021), which highlights the relationship between technological innovation in library organizations and policy support. Their research suggests that the absence of clear policies can hinder technology adoption, and that ambiguities at the organizational level can lead to resistance to change. Therefore, libraries must establish clear policies for blockchain adoption, alongside IT infrastructure development and operational strategies to ensure a smoother transition.

2) Relationship Between Perceived Security Benefits of Blockchain and Technological Factors (RQ2)

These findings support RQ2 by confirming a positive association between perceived security benefits and technological readiness, while also pointing to areas for further investigation such as integration challenges.

Respondents who perceived blockchain as beneficial for library resource management and copyright protection also demonstrated significantly higher evaluations of its technological factors, such as system integration potential and data security. This finding is consistent with previous research that emphasizes blockchain's role in enhancing data security and reliability (Hasan & Salah, 2019; Casino, Dasaklis, & Patsakis, 2019). It suggests that blockchain can contribute to ensuring data integrity within library systems.

Angelis & Da Silva (2019) identified security and reliability as key value factors of blockchain technology, and similar patterns were observed in this study. Specifically, blockchain's decentralized ledger system is perceived as a crucial mechanism for preventing data tampering and ensuring copyright protection, thereby enhancing the technological credibility of the system. However, despite high ratings for blockchain's security benefits, confidence in its full integration with existing library systems remained relatively low. This indicates the need for further technological evaluations to address potential compatibility issues with existing digital infrastructure.

3) Relationship Between Perceived Usefulness of Blockchain and Adoption Barriers (RQ3)

This result supports RQ3 by demonstrating that higher perceived usefulness of blockchain is associated with lower perceived adoption barriers, reinforcing theoretical expectations from TAM and validating empirical findings in the library context.

The study found that respondents who recognized blockchain as useful for resource management and copyright protection were less concerned about adoption barriers, such as cost and technical complexity. This aligns with the Technology Acceptance Model (TAM), which posits that perceived usefulness positively influences technology adoption intentions (Davis, 1989).

A similar trend was observed in the study by Mukherjee et al. (2023), which found that when

a new technology is perceived as beneficial, concerns over adoption barriers tend to decrease. The present study corroborates this finding, indicating that respondents who viewed blockchain favorably were less likely to perceive cost and complexity as significant obstacles. This suggests that increasing awareness and conducting empirical research on blockchain technology could reduce hesitancy and improve actual adoption rates in library organizations.

4) Relationship Between Blockchain Awareness, Perceived Ease of Adoption, and Adoption Intentions (RQ4)

These findings provide a direct response to RQ4 by illustrating that awareness of blockchain's potential increases both perceived ease of use and the intention to adopt, emphasizing the importance of targeted communication and demonstration strategies.

Respondents who believed that blockchain technology would be beneficial for libraries also exhibited higher levels of perceived ease of adoption and stronger adoption intentions. This finding aligns with prior research showing that positive perceptions of new technologies often translate into greater willingness to adopt them (Venkatesh et al., 2003).

Notably, respondents who considered blockchain effective for digital copyright protection also rated ease of adoption higher, suggesting that education and awareness programs are essential for encouraging wider adoption in library settings (Prewett et al., 2020).

Additionally, the study found that the greater the expectation that blockchain adoption would positively impact daily operations, the higher the actual intention to adopt the technology. This suggests that sharing real-world case studies of blockchain applications in libraries and providing practical demonstrations could help foster stronger adoption intentions among library practitioners.

5) Relationship Between Blockchain's Copyright Protection Function and Library Operational Innovation (RQ6)

This result supports RQ6 by showing that recognition of blockchain's role in copyright protection is positively associated with expectations for operational innovation, suggesting that technical functionality is directly linked to perceptions of service transformation.

The study examined the impact of blockchain's copyright protection functionality on library operations and service innovation. The results revealed that respondents who believed blockchain could improve operational efficiency also demonstrated stronger adoption intentions. This suggests that blockchain has the potential to drive library service innovation and that library administrators who actively implement blockchain systems could enhance trust and accessibility within their services (Sicilia & Visvizi, 2018).

Chen (2020) proposed that blockchain could optimize library operations through enhanced information integration, and the present study found similar patterns. Particularly, blockchain-based smart contracts could streamline lending systems, manage research data, and improve overall digital asset management in libraries (Wang et al., 2019).

6) Implications and Future Research Directions

The findings of this study provide empirical evidence that blockchain technology can be valuable

for library resource management and copyright protection and that technological factors and ease of adoption significantly influence adoption intentions. However, the study also highlights the potential challenge that a lack of organizational readiness and policy support could impede successful implementation. This emphasizes the importance of developing strategic frameworks that address the technical infrastructure and policy requirements necessary for blockchain adoption in libraries.

Future research should focus on developing tailored blockchain adoption models that consider factors such as library size, operational structures, and technological infrastructure levels. Additionally, further empirical research should assess real-world applications of blockchain in libraries, exploring how the technology affects user access to information and overall service satisfaction. By expanding these research areas, the practical feasibility and effectiveness of blockchain technology in library environments can be more thoroughly evaluated.

7) Practical and Theoretical Implications

While this study offers valuable implications for library practice, research, and education, several areas could be further developed to enhance its practical applicability. First, it would be beneficial to present a step-by-step implementation strategy tailored to different types of libraries, such as public, academic, or special libraries. This could include stages like needs assessment, staff training, pilot projects, and evaluation procedures.

Second, the study could be strengthened by addressing the ethical and societal challenges that may arise from blockchain adoption. Issues such as data privacy, user consent, and the risk of digital exclusion are particularly important in public service settings and deserve critical discussion.

Lastly, incorporating a cost–benefit perspective would help decision-makers evaluate the feasibility of adopting blockchain technologies. By outlining potential costs, resource requirements, and anticipated benefits, the study could support more informed and strategic planning in the library sector.

By considering these additions, the research would offer more comprehensive and actionable insights for future developments in blockchain-based library services.

6. Conclusion and Recommendations

This study analyzed the potential impact and feasibility of blockchain technology in library resource management and digital rights management (DRM) while examining differences in perceptions based on varying levels of awareness. The findings indicate that higher perceived usefulness and adoption feasibility of blockchain technology correlate with a more positive assessment of technological factors and adoption intentions. Specifically, respondents who highly valued blockchain's technological benefits, such as data security, integrity, and system integration potential, exhibited lower concerns regarding adoption barriers (e.g., cost burden, technical complexity). This suggests that greater trust and understanding of blockchain technology can significantly enhance its perceived adoption feasibility.

Conversely, the relationship between organizational readiness and blockchain awareness was weaker, with some items showing no statistically significant differences. This implies that organizational policies and institutional support are critical factors alongside technological readiness when introducing blockchain in libraries. Even if individual library users or practitioners recognize the usefulness

of blockchain technology, its actual implementation may remain challenging without clear institutional policies or sufficient technical infrastructure. Therefore, a structured, holistic approach addressing both technological and organizational factors is necessary for the successful adoption of blockchain in libraries.

Libraries should clearly define the necessity and objectives of blockchain adoption within their organizations and develop a strategic roadmap for implementation. This includes evaluating how blockchain can meaningfully contribute to library resource management and copyright protection while developing operational models that maximize the technology's advantages.

To ensure the practical effectiveness of blockchain adoption, libraries should first implement pilot projects and develop a gradual adoption strategy based on the results. Previous studies have emphasized the importance of conducting initial empirical research and pilot projects when adopting new technologies, as this approach helps identify technical challenges early and enhances staff adaptability. Libraries should, therefore, customize blockchain adoption strategies based on their operational environments, applying the technology incrementally and selectively before full-scale implementation.

It is essential to provide education and capacity-building programs to enhance the understanding of blockchain technology among library staff and users. This study found that higher awareness of blockchain technology correlates with lower resistance to adoption. Therefore, training programs, workshops, and awareness campaigns should be implemented to ensure that library professionals gain a clear understanding of blockchain concepts and applications.

Legal and institutional frameworks should be established to support blockchain adoption in libraries, particularly regarding digital copyright protection and data security. Legal reviews should be conducted to align blockchain technology with library operations, and clear guidelines and policies should be developed to minimize regulatory uncertainties and ensure a structured adoption process.

Future research should explore the practical feasibility of blockchain adoption in various types of libraries, considering factors such as library size, operational models, and existing technological infrastructure. Further empirical studies are also needed to assess how blockchain-based systems influence user accessibility, service efficiency, and overall satisfaction in real-world library environments. To enhance the external validity of this research, future studies should consider employing case-based approaches, tracking adoption trends over time, and comparing findings across different countries or types of libraries.

Acknowledgements

This research was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF) under grant number NRF-2023S1A5C2A02095114

References

Adel, H. M., & Younis, R. A. A. (2023). Interplay among blockchain technology adoption strategy, e-supply chain management diffusion, entrepreneurial orientation and human resources information system in banking. *International Journal of Emerging Markets, 18*(10), 3588-3615.

An, M., Fan, Q., Yu, H., & Zhao, H. (2023). Blockchain technology research and application: A systematic literature review and future trends. arXiv. https://arxiv.org/abs/2306.14802

Angelis, J., & Da Silva, E. R. (2019). Blockchain adoption: A value driver perspective. *Business Horizons, 62*(3), 307-314.

Berrios Moya, J. A. (2024). Blockchain for academic integrity: Developing the Blockchain Academic Credential Interoperability Protocol (BACIP). arXiv. https://arxiv.org/abs/2406.15482

Bhatia, S., Douglas, E. K., & Most, M. (2020). Blockchain and records management: Disruptive force or new approach? *Records Management Journal, 30*(3), 277-286. https://doi.org/10.1108/rmj-08-2019-0040

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and Informatics, 36*(1), 55-81. https://doi.org/10.1016/j.tele.2018.11.006

Chen, Y. (2020). Information integration in libraries. *Library Hi Tech, 38*(1), 210-219. https://doi.org/10.1108/lht-11-2017-0232

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30. https://doi.org/10.1080/07421222.2003.11045748

Gupta, M., & Dhillon, G. (2024). Exploring factors influencing blockchain adoption's effectiveness in business organizations. *Enterprise Information Systems, 18*(1), 1–22. https://doi.org/10.1080/17517575.2024.2379830

Hasan, H. R., & Salah, K. (2019). Combating deepfake videos using blockchain and smart contracts. *IEEE Security & Privacy, 17*(6), 8-14.

Hoy, M. B., & Brigham, T. J. (2017). An introduction to the blockchain and its implications for libraries and medicine. *Medical Reference Services Quarterly, 36*(3), 273-279.

Kushwaha, A. K., & Singh, A. P. (2021). Connecting blockchain with libraries: Opportunities and

risks. *Journal of Indian Library Association, 56*(3), 12-19.

Lawlor, B., Chalk, S., Frey, J., Hayashi, K., Kochalko, D., Shute, R., & Sopek, M. (2024). Blockchain technology and its use along the scientific research workflow. *Chemistry International, 46*(3), 12−17. https://doi.org/10.1515/ci-2024-0303

Mukherjee, S., Baral, M. M., Lavanya, B. L., Nagariya, R., Singh Patel, B., & Chittipaka, V. (2023). Intentions to adopt the blockchain: Investigation of the retail supply chain. *Management Decision, 61*(5), 1320-1351.

Prewett, K. W., Prescott, G. L., & Phillips, K. (2020). Blockchain adoption is inevitable—Barriers and risks remain. *Journal of Corporate Accounting & Finance, 31*(2), 21-28.

Sharma, G., & Singh, S. (2024). A survey on blockchain deployment for biometric systems. *IET Blockchain, 3*(2), 89−101. https://doi.org/10.1049/blc2.12063

Dudczyk, P., Dunston, J., & Crosby, G. (2024). Blockchain Technology for Global Supply Chain Management: A Survey of Applications, Challenges, Opportunities & Implications. *IEEE Access, 12, 70065-70088.* https://ieeexplore.ieee.org/document/10529266

Sicilia, M. A., & Visvizi, A. (2018). Blockchain and OECD data repositories: Opportunities and policymaking implications. *Library Hi Tech, 37*(1), 30-42. https://doi.org/10.1108/lht-12-2017-0276

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Wang, X., Yang, W., Noor, S., Chen, C., Guo, M., & van Dam, K. H. (2019). Blockchain-based smart contract for energy demand management. *Energy Procedia, 158*, 2719-2724. https://doi.org/10.1016/j.egypro.2019.02.028

[About the author]

Ho-won Kim is a Ph.D. candidate in Library and Information Science at Konkuk University, conducting research on information system development and data processing using IT technologies. His interests lie in database management and information classification, and he is actively engaged in applying cutting-edge IT technologies to research in Library and Information Science.

Younghee Noh has an MA and PhD In Library and Information Science from Yonsei University, Seoul. She has published more than 50 books, including 3 books awarded as Outstanding Academic Books by Ministry of Culture, Sports and Tourism (Government) and more than 120 papers, including one selected as a Featured Article by the Informed Librarian Online in February 2012. She was listed in the Marquis Who's Who in the World in 2012-2016 and Who's Who in Science and Engineering in 2016-2017. She received research excellence awards from both Konkuk University (2009) and Konkuk University Alumni (2013) as well as recognition by "the award for Teaching Excellence" from Konkuk University in 2014. She received research excellence awards form 'Korean Y. Noh and Y. Shin International Journal of Knowledge Content Development & Technology Vol.9, No.3, 75-101 (September 2019) 101 Library and Information Science Society' in 2014. One of

the books she published in 2014, was selected as ‘Outstanding Academic Books’ by Ministry of Culture, Sports and Tourism in 2015. She received the Awards for Professional Excellence as Asia Library Leaders from Satija Research Foundation in Library and Information Science (India) in 2014. She has been a Chief Editor of World Research Journal of Library and Information Science in Mar 2013 ~ Feb 2016. Since 2004, she has been a Professor in the Department of Library and Information Science at Konkuk University, where she teaches courses in Metadata, Digital Libraries, Processing of InterSnet Information Resources, and Digital Contents.

Jeong-won Roh is currently pursuing a Ph.D. in Library and Information Science at Konkuk University while balancing research and practical experience in the IT field. Her primary research interests include information management systems and data analysis. She focuses on interdisciplinary studies combining IT and Library and Information Science.