

**Digital Library Service Innovation in Higher Education: A Comparative Study of IPDN and Universiti Kebangsaan Malaysia using Diffusion Innovation and Bibliometric Analysis**



**Inovasi Layanan Perpustakaan Digital di Pendidikan Tinggi: Studi Komparatif IPDN dan Universiti Kebangsaan Malaysia (UKM) dengan Pendekatan Difusi Inovasi dan Analisis Bibliometrik**

**Zahra Aqilah Dytihana<sup>1</sup>, Mohammad Rezza Fahlevvi<sup>2</sup>, Wenty Zahrati<sup>3</sup>, Noordeyana Tambi<sup>4</sup>**

33.0253@praja.ipdn.ac.id<sup>1</sup>, rezza@ipdn.ac.id<sup>2</sup>, wenty@ipdn.ac.id<sup>3</sup>, deyana@ukm.edu.my<sup>4</sup>

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**Corresponding Author:**

Email: 33.0253@praja.ipdn.ac.id

Affiliation: Governance Institute of Home Affairs (IPDN) Jatinangor



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<sup>1,2,3</sup> Governance Institute of Home Affairs, **Indonesia**;

<sup>4</sup> Universitas Kebangsaan Malaysia, **Malaysia**.

**Abstract**

**Background/Problem Statement:** The rapid development of information technology has encouraged higher education institutions to innovate in library services, particularly through the implementation of digital libraries. However, gaps remain in service quality, levels of innovation adoption, and international collaboration among academic libraries, including those of the Institute of Home Affairs Governance (Institut Pemerintahan Dalam Negeri/IPDN) and Universiti Kebangsaan Malaysia (UKM). **Purpose:** This study aims to examine the comparative innovation of digital library services at IPDN and Universiti Kebangsaan Malaysia (UKM) using a Diffusion of Innovation perspective to improve the quality of information services and digital literacy in higher education. **Method:** This research employs a qualitative approach using documentation studies supported by bibliometric analysis. Data were collected from scholarly publications, institutional reports, and documents related to the development of digital libraries at IPDN and UKM. Data analysis was conducted using a descriptive-analytical method based on Everett Rogers' diffusion of innovation theory to examine the adoption process, innovation characteristics, and patterns of acceptance of digital library services. **Result:** The findings indicate that, based on five main indicators—(1) service accessibility, (2) compatibility with academic needs, (3) system complexity, (4) user adoption level, and (5) innovation sustainability—digital library services at Universiti Kebangsaan Malaysia (UKM) demonstrate greater advantages compared to Institut Pemerintahan Dalam Negeri (IPDN). These advantages are particularly evident in broader information accessibility, higher compatibility with academic requirements, and a more significant level of innovation adoption among users. Meanwhile, IPDN shows progress in the initial implementation of innovation but still faces limitations in optimizing the utilization of digital services. In addition, the bibliometric analysis reveals a significant increase in scholarly publications related to digital libraries and digital literacy, indicating growing academic attention to these topics in a global context. **Conclusion:** This study concludes that digital library services at Universiti Kebangsaan Malaysia (UKM) are superior to those at Institut Pemerintahan Dalam Negeri (IPDN) in terms of accessibility, compatibility, and user adoption, while IPDN continues to face challenges related to system complexity and innovation sustainability. These findings contribute theoretically to the Diffusion of Innovation literature and offer practical implications for the development of digital library services in higher education.

**Keywords:** : service innovation, digital library, digital of innovation, comparative study .

**Abstrak**

**Latar Belakang/Permasalahan:** Perkembangan teknologi informasi mendorong perguruan tinggi untuk berinovasi dalam pelayanan perpustakaan, khususnya melalui pemanfaatan perpustakaan digital. Namun, masih terdapat kesenjangan dalam kualitas layanan, tingkat adopsi inovasi, serta kolaborasi internasional antarperpustakaan perguruan tinggi, termasuk antara Institut Pemerintahan Dalam Negeri (IPDN) dan Universiti Kebangsaan Malaysia (UKM). **Tujuan:** Penelitian ini bertujuan untuk menganalisis perbandingan inovasi layanan perpustakaan digital di IPDN dan Universiti Kebangsaan Malaysia (UKM) berdasarkan perspektif difusi inovasi dalam upaya meningkatkan kualitas layanan informasi dan literasi digital di pendidikan tinggi. **Metode:** Penelitian ini menggunakan pendekatan kualitatif dengan teknik studi dokumentasi yang didukung oleh analisis bibliometrik. Data diperoleh dari publikasi ilmiah, laporan institusional, serta dokumen terkait pengembangan perpustakaan digital di IPDN dan UKM. Analisis data dilakukan secara deskriptif-analitis dengan menggunakan teori difusi inovasi Everett Rogers untuk mengkaji proses adopsi, karakteristik inovasi, dan pola penerimaan

pelayanan perpustakaan digital. **Hasil:** Hasil penelitian menunjukkan bahwa berdasarkan lima indikator utama, yaitu (1) aksesibilitas layanan, (2) kompatibilitas dengan kebutuhan akademik, (3) kompleksitas penggunaan sistem, (4) tingkat adopsi pengguna, dan (5) keberlanjutan inovasi, layanan perpustakaan digital di Universiti Kebangsaan Malaysia (UKM) memiliki keunggulan dibandingkan Institut Pemerintahan Dalam Negeri (IPDN). Keunggulan tersebut terutama terlihat pada aspek aksesibilitas informasi yang lebih luas, tingkat kompatibilitas yang lebih tinggi dengan kebutuhan akademik, serta tingkat adopsi inovasi yang lebih signifikan di kalangan pengguna. Sementara itu, IPDN menunjukkan perkembangan pada aspek implementasi awal inovasi, namun masih menghadapi keterbatasan dalam hal optimalisasi pemanfaatan layanan digital. Selain itu, analisis bibliometrik menunjukkan adanya peningkatan signifikan dalam publikasi ilmiah terkait perpustakaan digital dan literasi digital, yang mengindikasikan meningkatnya perhatian akademik terhadap topik tersebut dalam konteks global. **Kesimpulan:** Penelitian ini menyimpulkan bahwa layanan perpustakaan digital di UKM lebih unggul dibandingkan IPDN pada indikator aksesibilitas, kompatibilitas, dan tingkat adopsi, sedangkan IPDN masih menghadapi tantangan pada kompleksitas sistem dan keberlanjutan inovasi. Temuan ini memberikan kontribusi teoretis pada kajian difusi inovasi serta implikasi praktis bagi pengembangan layanan perpustakaan digital di pendidikan tinggi.

**Kata kunci:** inovasi pelayanan, perpustakaan digital, difusi inovasi, studi komparatif

## **I. INTRODUCTION**

**Background.** Advancements in information technology have enabled libraries to transition from conventional services to digital services that are more open and inclusive (Qolbi et al., 2025). Digital libraries have significantly improved access to information by overcoming geographical and temporal barriers and the constraints of traditional book formats. As a result, digital libraries now serve as technology-based information service centers, playing a strategic role in supporting academic activities across an increasing number of educational institutions (Amin et al., 2022).

Digital libraries play an important role in higher education, especially in supporting students in improving their digital literacy. Besides making it easier for students to access various information resources, digital libraries also help students learn to explore, assess, and use information more critically and effectively. Because of this, the development of digital library services should not focus solely on technology but also on building users' skills in using academic information for learning, research, and other academic activities. The aim of developing these services is not only to expand access to information but also to help users make better use of it, as shown in several bibliometric studies on digital libraries in education (Suhada & Yuadi, 2024).

In Southeast Asia, the development of digital libraries acts as a strategic approach to improve the quality of learning, research, and cross-border academic collaboration, as demonstrated by the partnership between Institut Pemerintahan Dalam Negeri (IPDN) in Indonesia and Universiti Kebangsaan Malaysia (UKM). However, variations in institutional contexts, educational policies, technological readiness, and users' digital literacy levels significantly affect the dynamics and outcomes of digital library service innovations within these institutions (Qolbi et al., 2025).

The study by Amin et al. (2022) demonstrates that open-access digital library services provide greater ease in obtaining information, broaden the use of scholarly literature, and help enhance literacy culture within academic environments. Similar findings indicate that implementing open-access digital library services can increase the visibility of scholarly works and expand the use of digital information resources in higher education institutions.

**Problems.** The libraries at Institut Pemerintahan Dalam Negeri (IPDN) and Universiti Kebangsaan Malaysia (UKM) both offer expanding digital library services, but there are noticeable differences in areas such as the availability of digital collections, ease of access, feature range, and user engagement. These differences show that each institution adopts innovation, maintains service quality, and uses digital libraries in higher education to varying degrees. Factors such as development strategies, policy support, system compatibility, and available resources all play a role. Comparing data from both libraries is important for identifying their strengths, weaknesses, and opportunities to improve digital library services. Also, there are still a few studies that directly compare digital library innovations in the ASEAN region. This situation shows the need for a comparative analysis to identify innovation patterns, challenges in adoption, and ways to improve digital library services in higher education.

The libraries at Institut Pemerintahan Dalam Negeri (IPDN) and Universiti Kebangsaan Malaysia (UKM) have each introduced various digital library service innovations as a response to the rapid development of information technology and the evolving needs of users. However, the degree to which these innovations have been adopted and utilized is not uniform; instead, it shows significant variation across several aspects, such as the availability of digital collections, the accessibility of services, the range of service features, and the level of user engagement. These differences reflect not only the diversity in innovation adoption and service quality, but also the effectiveness of digital library implementation in higher education institutions. Several factors, including development strategies, support from institutional policies, system interoperability, and the capacity of institutional resources, shape these variations. Therefore, conducting a comparative analysis of these factors is important to better understand the strengths, weaknesses, and potential areas for improvement in digital library services. Furthermore, there is still a lack of empirical research directly comparing digital library service innovations across the ASEAN region. This situation highlights the importance of comparative studies to clarify innovation patterns, identify adoption challenges, and identify opportunities to improve digital library services in higher education.

**Previous Literature Review.** The progress of information technology has encouraged academic libraries to move from traditional to digital services that are more adaptive, integrated, and user focused. In higher education, digital libraries not only act as providers of electronic compilations but also serve as important centers for knowledge management, the development of digital literacy, and support for teaching and research activities.

Ahmad and Hussain (2021) explain that the successful implementation of digital libraries in higher education institutions is influenced by technological readiness, organizational support, institutional policies, and users' ability to utilize digital services. Their study demonstrates that the adoption of library technology depends not only on the availability of infrastructure but also on institutional preparedness in managing organizational change.

Boateng and Liu (2022) found that the digital transformation of academic libraries requires integrating information systems, facilitating data interoperability, and developing services tailored to users' needs. Their study indicates that libraries achieve successful digital transformation by aligning technology integration with service strategies that enhance the user experience.

Liu and Briggs (2022) highlight that user experience is a crucial factor in the success of digital library services. User-friendly, responsive, and highly accessible systems have been shown to increase service utilization among academic communities. These findings indicate that innovation success is determined not only by technological sophistication but also by users' perceived ease of use. The study by Otoo and Mishra (2021) shows that the quality of digital library services is influenced by system dependability, ease of access, service speed,

and user pleasure. The higher the quality of services provided, the greater the acceptance and utilization of digital library services.

Furthermore, Khan and Bhatti (2021) explain that designing smart libraries needs digital competencies from both librarians and users. Sufficient digital skills are seen as an important factor in ensuring that technology-based library services can be delivered successfully. Mishra dan Kumar (2023) found that using digital libraries can improve research productivity, facilitate access to scholarly resources, and enhance learning quality. Their study indicates that digital libraries play an important role in supporting knowledge-based higher education. Suhada and Yuadi (2024), using bibliometric analysis, found that there has been a significant increase in scientific publications on digital libraries and digital literacy over the last 10 years. This shows that more academics are paying attention to the development of digital library services as an important part of higher education's changes.

While many studies have investigated the implementation of digital libraries, most focus on a single institution or address only specific aspects, such as service quality, digital literacy, or technological transformation. Comparative research on digital library service innovations among higher education institutions in the ASEAN region is still limited. To address this gap, the present study conducts a comparative analysis of digital library service innovations at the Institut Pemerintahan Dalam Negeri (IPDN) and the Universiti Kebangsaan Malaysia (UKM) through the lens of Everett Rogers' Diffusion of Innovation theory.

**State of The Art.** So far, there has been no comprehensive study that compares digital library service innovations at Institut Pemerintahan Dalam Negeri (IPDN) and Universiti Kebangsaan Malaysia (UKM) using the diffusion of innovation framework. Using this approach, it is possible to examine more closely the five main indicators of innovation diffusion: relative advantage, compatibility, complexity, trialability, and observability.

**Purpose.** This study analyzes the comparative innovation of digital library services at the Institut Pemerintahan Dalam Negeri (IPDN) and the Universiti Kebangsaan Malaysia (UKM) through the lens of the diffusion of innovation theory. The analysis focuses on five key indicators: relative advantage, compatibility, complexity, trialability, and observability.

## **II. METHODS**

A qualitative, descriptive-comparative design was employed to examine digital library service innovations at Institut Pemerintahan Dalam Negeri (IPDN) and Universiti Kebangsaan Malaysia (UKM). This approach facilitates a comprehensive understanding of the processes of innovation, adoption, and implementation of digital library services within both institutions.

Data for this study were primarily obtained from secondary sources through document analysis. The analyzed documents comprised institutional reports, official library websites, digital library development policies, scientific publications, journal articles, and other materials relevant to advancing digital library services at IPDN and UKM. In addition to document analysis, bibliometric analysis was employed to map research trends in digital libraries and innovation diffusion. Bibliometric data were extracted from the Scopus database using keywords such as "digital library," "library innovation," "digital literacy," and "academic library." The dataset included publications from 2015 to 2025, facilitating the identification of recent trends and developments in this field.

Bibliometric data were analyzed using VOSviewer, facilitating the mapping of keyword co-occurrence networks, the identification of author connections through co-authorship, and the identification of research topic trends. The results of this bibliometric analysis provided stronger support for interpreting comparative research findings, thereby enhancing the reliability and contextual relevance of the study's conclusions. The research data were analyzed using both descriptive and interpretive approaches, guided by Everett

Rogers's Diffusion of Innovations theory. This theoretical framework emphasizes five key characteristics of innovation: relative advantage, compatibility, complexity, trialability, and observability. These aspects provided a structured basis for comparing digital library service innovations at IPDN and UKM, facilitating a systematic and meaningful analysis of institutional differences and similarities.

The research procedure comprised the following stages: (1) identification and collection of documents; (2) selection of data based on research relevance; (3) bibliometric analysis using VOSviewer; (4) classification of data according to innovation diffusion indicators; (5) interpretation and comparison of findings between IPDN and UKM; and (6) formulation of research conclusions. This approach aims to offer a comprehensive understanding of the implementation of digital library service innovations in both institutions.

### III. RESULTS AND DISCUSSION

**Level of Awareness and Accessibility of Digital Library Services.** The differences in accessibility between IPDN and UKM suggest that the effectiveness of digital library services depends not only on technological availability but also on the institution's capacity to integrate these services into routine academic activities. UKM has established a digital ecosystem that allows students, lecturers, and researchers to access diverse information resources through a unified service system. This arrangement offers a significant relative advantage by enabling users to obtain information more rapidly, efficiently, and flexibly.

Conversely, at IPDN, access to digital information resources remains suboptimal, particularly in terms of the integration of digital collections and the ease of information retrieval. According to the Diffusion of Innovations theory, such limitations may influence the knowledge stage, which is when users begin to recognize and understand an innovation. Improved accessibility increases the likelihood that an innovation will be accepted and widely adopted by users.

These findings are consistent with the study by Ahmad dan Hussain (2021), which states that accessibility and ease of use are key factors in increasing the acceptance of digital libraries within higher education environments.

**Perceptions of Benefits and Complexity in Digital Services.** Users' perceptions of the benefits provided by digital services are a critical determinant of innovation success. The findings of this study indicate that UKM users perceive greater benefits because the available services are integrated with academic, research, and scientific publication requirements. This integration demonstrates a high degree of compatibility between the implemented innovation and users' needs.

In contrast, users perceive the complexity of IPDN's services as relatively high. Several service features remain partially integrated, requiring users to invest additional time in understanding system operations. According to Everett Rogers' innovation diffusion theory, the increased complexity of innovations. Consequently, simplifying the system and enhancing user experience are strategic measures to improve the utilization of digital library services.

These findings align with the results of Liu and Briggs (2022), who emphasize that user experience significantly influences digital service utilization. Simple, responsive, and easy-to-understand systems tend to increase user satisfaction and loyalty.

**Adoption and Implementation of Service Innovation.** The extent of innovation adoption at IPDN and UKM demonstrates distinct levels of institutionalization of digital library services. At UKM, digital library services are fully integrated into the academic culture. These services not only address information needs but also facilitate learning, research, and scientific collaboration. This suggests that the innovation diffusion process at UKM has effectively reached both the implementation and confirmation stages.

In contrast, innovation implementation at IPDN is still in the developmental phase. Although several digital services have been introduced, their utilization is uneven across user groups. Challenges such as limited human resources, insufficient policy support, and organizational readiness continue to impede the rate of innovation adoption.

According to Everett Rogers (2003), successful innovation implementation depends not only on the quality of the innovation but also on a supportive organizational environment. Consequently, enhancing institutional capacity is essential for accelerating the adoption of digital library services at IPDN.

**Sustainability in the Utilization of Digital Library Services.** Utilization sustainability is a key indicator of the long-term success of innovation. At UKM, usage of the digital library service shows a consistent, sustainable trend. This pattern suggests that users derive tangible benefits, thereby reinforcing their confidence to continue engaging with these services.

Conversely, at IPDN, digital library service usage remains situational and is primarily driven by specific needs. This pattern indicates that the confirmation stage of innovation adoption has not been fully realized. According to the Diffusion of Innovations framework, the confirmation stage is reached when users choose to continue utilizing an innovation based on their accumulated experiences.

The sustainability of service utilization can be enhanced by improving service quality, providing regular digital literacy training, and strengthening technical support for users. These measures will help increase users' trust in the benefits of digital library services.

**Academic Trends and Scholarly Support Identified through Bibliometric Analysis.** Bibliometric analysis demonstrates that research on digital libraries has grown substantially in recent years. The rise in publications after 2020 indicates that digital transformation is a primary concern in international higher education development.

Bibliometric visualization indicates that keywords including digital library, digital literacy, information access, innovation, and higher education are closely linked. These results suggest that digital library development is intrinsically connected to the advancement of digital literacy and the transformation of technology-driven educational services.

Furthermore, bibliometric results indicate that research on the implementation of digital libraries in developing countries remains limited compared to developed countries. This gap presents opportunities for further investigation into digital library development strategies tailored to the specific characteristics of higher education institutions in the ASEAN region, particularly in Indonesia and Malaysia.

**Implications for Research.** Theoretically, this study reinforces the relevance of the Diffusion of Innovations framework in explaining the adoption of digital library services within higher education institutions. The five characteristics of innovation—relative advantage, compatibility, complexity, trialability, and observability—significantly influence both the acceptance and successful implementation of innovations.

Practically, the findings offer recommendations to improve system interoperability, expand digital collections, enhance users' digital literacy, and strengthen international collaboration with UKM and other institutions. These initiatives are anticipated to enhance the quality of digital library services and support the sustainable digital transformation of higher education.

**Research Indicator 1: Level of Knowledge and Accessibility of Digital Library Services.** The findings indicate that differences in knowledge levels between IPDN and UKM are not solely due to service availability but also to information dissemination strategies and user experience design. UKM has comprehensively integrated digital services into its academic ecosystem, whereas IPDN remains at a partial stage of integration. This suggests

that the primary barriers lie not in the technology itself, but rather in innovation management and organizational communication.

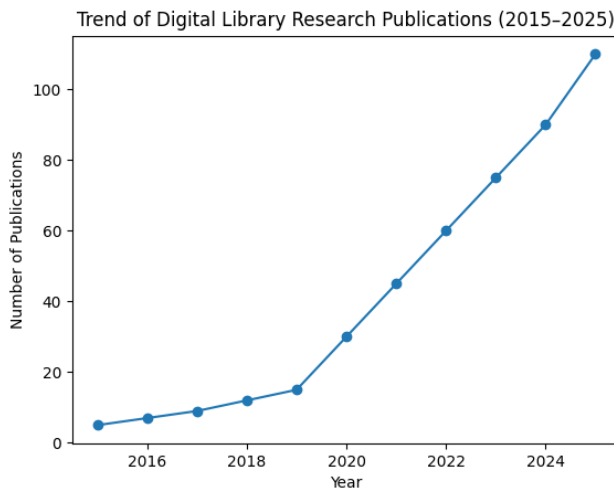
**Research Indicator 2: Users’ Perceptions of Service Benefits and Complexity.** The perceived complexity at IPDN demonstrates a gap between technology and users, as the system remains insufficiently user-friendly. In contrast, UKM has reduced complexity through effective system integration and digital literacy initiatives. These findings indicate that perceptions of complexity are shaped primarily by system design rather than by users’ capabilities.

**Research Indicator 3: Degree of Adoption and Implementation of Service Innovation.** The limited implementation observed at IPDN suggests that innovation adoption has not progressed to the stage of institutionalization. Structural factors, including funding and human resources, indicate that digital innovation involves not only technological considerations but also organizational governance.

**Research Indicator 4: Sustainability of Use and Confirmation of Adoption.** The sustainability of digital library service utilization at UKM reflects a process of confirmation reinforcement, whereas at IPDN, the pattern remains one of trial without commitment. This indicates that users’ experiences have not yet been sufficiently strong to establish long-term loyalty in service utilization.

**Research Indicator 5: Academic Trends and Scholarly Support Identified through Bibliometric Analysis.** The increase in publications after 2020 reflects not only an academic trend but also the acceleration of global digital transformation driven by the pandemic. Despite this growth, the predominance of specific research themes indicates persistent gaps, particularly regarding local implementation. These findings underscore the necessity for further research on contextualized strategies for digital library development, with particular emphasis on higher education institutions in the ASEAN region.

**Figure 1.**  
Trend of Digital Library Research Publication (2015-2025)



Source : Researcher Data

**Discussion of Research Findings.** According to the Diffusion of Innovations theory, the success of innovation adoption depends on users’ perceptions of its characteristics. The results of this study show that UKM exhibits a higher level of adoption of digital library service innovation than IPDN across most analyzed indicators.

Regarding the relative advantage indicator, UKM’s digital library services offer more tangible benefits by providing broader access to electronic collections, international journals, institutional repositories, and integrated information retrieval services. These

features enhance information search efficiency and more effectively support academic activities. In contrast, IPDN's digital services are primarily limited to basic access to digital collections, resulting in benefits that are not yet fully optimized for users. These findings align with Mishra dan Kumar (2023) , who state that access to comprehensive digital information resources increases academic productivity. Regarding the compatibility indicator, UKM's digital library services demonstrate a high degree of alignment with users' needs. The developed system has been integrated with learning, research, and scientific publication activities, enabling users to obtain information quickly and efficiently. Meanwhile, IPDN's digital services still face challenges in fully integrating various information resources and academic services. This condition indicates that the compatibility of innovation with users' needs is a crucial factor in determining the success of innovation adoption.

Concerning the complexity indicator, the findings indicate that UKM users encounter a relatively low level of complexity, as the system is simpler, more responsive, and easier to understand. In contrast, several of IPDN's digital services require further interface simplification and enhancements in navigation usability. Liu and Briggs (2022), assert that users' perceptions of system complexity directly influence their willingness to utilize digital services. A lower perceived level of complexity increases the likelihood that an innovation will be accepted and continuously utilized.

Regarding the trialability indicator, UKM demonstrates a stronger capacity to provide users with opportunities to try and explore the available digital services. Various user guides, information literacy training programs, and technical support help users understand the benefits of these services before adopting them in depth. On the other hand, IPDN still needs to expand its socialization programs and user assistance initiatives to ensure the innovation adoption process proceeds more effectively.

In terms of the observability indicator, the benefits of UKM's digital library services are more easily observable to users through improved access to information, easier access to scholarly references, and stronger support for academic activities. These achievements foster positive perceptions, thereby accelerating the diffusion of innovation. In contrast, at IPDN, the benefits of digital services are not yet fully visible to all users, resulting in a more gradual confirmation process of innovation adoption.

The bibliometric analysis further indicates that research on digital libraries has increased significantly since 2020. This growth reflects that digital transformation has become an important issue in the development of higher education across various countries. The most dominant keywords identified include digital library, digital literacy, information access, innovation, and higher education. These findings suggest that digital library service innovation cannot be separated from the advancement of digital literacy and the broader transformation of higher education.

The findings of this study support the Diffusion of Innovations theory, which posits that relative advantage, compatibility, and low complexity are primary determinants of successful innovation adoption. The observed differences between IPDN and UKM reflect not only technological variations but also distinctions in innovation management strategies, organizational readiness, policy support, and users' digital literacy levels. Consequently, the development of digital library services at IPDN should prioritize system integration, the enhancement of digital literacy, the simplification of service mechanisms, and the promotion of international collaboration to improve the effectiveness of future innovation adoption.

**Research Limitations (Disclaimer).** This study has several limitations that should be acknowledged when interpreting the findings. First, the comparative analysis between IPDN and UKM is limited to only two higher education institutions, which may affect the extent to which the results can be generalized to other universities with different

organizational structures, technological capacities, and digital transformation approaches. Future research involving a wider range of institutions from diverse regions would provide a more comprehensive understanding of digital library development and adoption. Second, this study primarily examines digital library accessibility, perceived benefits, complexity, adoption, and sustainability from institutional and user perspectives. While these aspects provide valuable insights into the diffusion of innovation process, other important factors, including institutional policies, financial support, technological readiness, and librarian competencies, were not explored in detail. Further studies could consider these organizational and managerial factors to develop a more holistic perspective on digital library implementation. Third, the findings regarding user experiences reflect the conditions and utilization patterns of digital library services during the research period. As technology, service quality, and institutional policies continue to evolve, users' perceptions and adoption behaviors may also change over time. Therefore, longitudinal research is recommended to examine the ongoing development and sustainability of digital library innovations. Finally, the bibliometric analysis in this study is influenced by the selected databases, keywords, and inclusion criteria, meaning that some relevant studies may not have been identified. Future bibliometric studies could expand database coverage and apply additional analytical approaches to achieve a broader understanding of global digital library research trends.

#### IV. CONCLUSION

This study concludes that digital library service innovation through international collaboration between the Institut Pemerintahan Dalam Negeri (IPDN) and the Universiti Kebangsaan Malaysia (UKM) demonstrates differing levels of maturity and adoption. UKM has been shown to achieve a higher level of innovation adoption by integrating technology, management strategies, and users' digital literacy more effectively. In contrast, IPDN remains in a transitional phase toward broader adoption, constrained by funding limitations, system interoperability, and the readiness of human resources.

The findings of this study indicate that the availability of technology does not solely determine the success of digital library service innovation. Institutional readiness, supportive policies, and users' perceptions and understanding of digital technology are also critical factors. Through the framework of innovation diffusion theory, the characteristics of the innovation, particularly its relative advantage and alignment with academic needs, are shown to significantly influence both the adoption and sustained use of digital library services.

Furthermore, the findings indicate that cross-country collaboration serves as a strategic mechanism for institutional learning in advancing digital library services. The partnership between IPDN and UKM demonstrates the potential to accelerate the diffusion of innovation through knowledge exchange, joint collection development, and integrated interlibrary services. Nevertheless, more structured and sustainable planning is necessary to ensure that both institutions fully realize these benefits.

This study is limited by the scope of the institutions examined and the exclusive use of a qualitative approach, which restricts the generalizability of the findings. Future research should include a broader range of higher education institutions and employ both qualitative and quantitative methods to achieve a more comprehensive understanding of digital library service innovation in the ASEAN region.

**Future Work.** The findings of this study create opportunities for further research into sustainable models of international collaboration in digital libraries, particularly regarding the measurement of innovation impacts on learning quality, research productivity, and the development of students' digital literacy. Subsequent studies could build on these results by incorporating policy analysis, user satisfaction assessments, and the integration of intelligent technologies within digital library services. Consequently, this study is expected to make a meaningful contribution to the advancement of library and information science

and to offer practical benefits to higher education institutions and the wider academic community.

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