



Development of an Adaptive Digital Library Service Model to Support Scholarly Communication

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ABSTRACT

This study aims to develop an adaptive digital library service model to support scholarly communication in higher education. The study responds to the growing need for academic libraries to move beyond resource provision and provide integrated support for information access, research assistance, repository use, publication literacy, and digital scholarly communication. This research used a qualitative case study approach at the Library of Universitas Lampung, Bandar Lampung, Indonesia, from September to November 2025. Data were collected through semi-structured interviews, limited participatory observation, and documentation. The participants consisted of 20 informants, including students, lecturers, researchers, librarians, information technology staff, and repository or publication service managers. The data were analyzed using thematic analysis through data condensation, data display, and conclusion drawing. The findings reveal five main themes: access to scholarly information, user experience in digital service use, librarian support in scholarly communication, integration of digital platforms, and the need for continuous service evaluation. These findings show that adaptive digital library services require user-centered access, digital literacy support, librarian-mediated research assistance, repository integration, responsive technology infrastructure, and structured evaluation. The study contributes to the development of user-centered digital library theory and offers practical guidance for strengthening academic library services as part of institutional research infrastructure. Future studies should examine adaptive digital library models across different institutional contexts and explore their impact on research productivity and scholarly visibility.



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1. Introduction

The development of digital scholarly communication has changed the role of academic libraries from collection-based institutions into adaptive knowledge service centers. Academic libraries now support access to electronic resources, institutional repositories, research visibility, publication literacy, reference management, and research data services. This shift became

stronger after the expansion of online learning and remote research practices. Mehta and Wang (2020) found that digital library services became essential for maintaining academic access during periods of physical restriction. Appleton (2021) also showed that the pandemic accelerated digital service transformation in academic libraries. These studies indicate that digital library services must respond to changing user behavior, research workflows, and scholarly communication needs.

In Indonesia, digital transformation in academic libraries has become more urgent because universities must improve research productivity, publication quality, accreditation performance, and institutional visibility. Academic communities increasingly depend on digital repositories, subscribed databases, e-journals, and online reference services. However, the availability of digital platforms does not always guarantee effective use. Many users still face difficulties in locating relevant sources, accessing databases, evaluating scholarly information, and using institutional repositories. Maryati et al. (2020) emphasized that Indonesian academic libraries need clearer implementation strategies for digital research support services. Septiandi et al. (2025) also showed that digital library services affect user behavior, especially in how students search, access, and use scholarly information.

Field problems in academic libraries often appear in the gap between service provision and user experience. Students may use digital library systems only when they receive direct instruction from lecturers or librarians. Lecturers and researchers may need support for publication searches, citation tracking, repository submission, and journal selection. Librarians may struggle to redesign services because digital scholarly communication requires new competencies, stronger technological readiness, and deeper collaboration with academic units. Begum and Elahi (2022) found that digital library services can support online learning, but their success depends on accessibility, user readiness, and service clarity. Kayode et al. (2020) also confirmed that ease of use and user-friendliness influence the adoption of web-based library services.

This issue is important because digital library services shape the quality of academic culture. From an educational perspective, adaptive digital library services help students and researchers develop information literacy, publication literacy, and ethical use of scholarly sources. From a social perspective, these services can reduce unequal access between users with high digital skills and users who need more guidance. From an institutional perspective, digital library services strengthen research visibility, repository use, and the dissemination of academic work. Awan et al. (2022) showed that university libraries need to provide research support services across the research process. Ali et al. (2023) also found that research support services and information literacy have become important themes in academic library development.

Previous studies have discussed digital library services, research support services, institutional repositories, and research data management. However, many studies still focus on service availability, system use, bibliometric mapping, or user satisfaction. Fewer studies explore how users experience digital library services as part of scholarly communication practices. This gap is important because scholarly communication is not only a technical process. It also involves user interpretation, academic habits, institutional support, librarian roles, and trust in digital systems. Amanullah and Abrizah (2023) discussed librarians' roles in research data management services, while Sheikh et al. (2023) explained the development of research data management in academic libraries. Howlett and Thorpe (2024) argued that research support services in university libraries need to be redefined based on current academic needs.

Based on this background, this study aims to develop an adaptive digital library service model to support scholarly communication in higher education. The study focuses on the experiences of students, lecturers, researchers, librarians, information technology staff, and repository managers in using and managing digital library services. This study uses a qualitative approach because it seeks to understand meanings, practices, barriers, and service needs from the perspective of direct

users and service providers. Theoretically, this study contributes to user-centered digital library studies, scholarly communication, and adaptive service development. Practically, this study offers a service model that can help academic libraries improve access to scholarly information, strengthen research support, increase repository use, and build more responsive digital library services.

2. Materials and Methods

This study used a qualitative approach with a case study design. This design was selected because the study aimed to understand user experiences, service practices, institutional challenges, and adaptation processes in the development of digital library services. A case study design allowed the researcher to examine the relationship between digital systems, user needs, librarian roles, and scholarly communication practices in one institutional setting. The qualitative approach was appropriate because this study did not seek to measure service effectiveness statistically. Instead, it explored how users and service providers interpreted digital library services in their academic activities.

The study was conducted at the Library of Universitas Lampung, Bandar Lampung, Indonesia, from September to November 2025. This location was selected purposively because the university library provides digital services such as an online public access catalog, institutional repository, e-journal access, e-book services, digital reference services, and publication support facilities. The research period of three months allowed the researcher to conduct interviews, observe service practices, collect institutional documents, validate data, and analyze findings in stages.

The participants were selected using purposive sampling. This technique was used because the study required informants who had direct experience in using or managing digital library services. The participants consisted of 20 informants: eight undergraduate or postgraduate students, four lecturers or researchers, four librarians, two information technology staff members, and two institutional repository or publication service managers. The criteria for participant selection included direct experience with digital library services for at least one semester, involvement in academic or research activities, and willingness to provide detailed information. Snowball sampling was also used when initial participants recommended other informants who had relevant experience with repository management, scholarly publication, or research support services.

Data were collected through semi-structured interviews, limited participatory observation, and documentation. Semi-structured interviews were used to explore user experiences, access barriers, service expectations, publication support needs, and perceptions of adaptive digital library services. Interviews also examined how librarians and system managers understood their roles in supporting scholarly communication. Observations were conducted on digital service activities, including catalog searches, repository access, reference consultations, database use, and user assistance sessions. Documentation included service guidelines, repository pages, digital service forms, institutional policies, user guides, training materials, and available usage reports.

Data validity was maintained through source triangulation, method triangulation, member checking, and audit trail. Source triangulation was conducted by comparing information from students, lecturers, researchers, librarians, information technology staff, and repository managers. Method triangulation was conducted by comparing interview data, observation notes, and institutional documents. Member checking was carried out by asking selected key informants to review interview summaries and preliminary interpretations. An audit trail was maintained by documenting interview notes, observation records, coding decisions, document sources, and analytical memos. These strategies were used to strengthen credibility, dependability, and transparency in the qualitative research process.

Data were analyzed using thematic analysis supported by the interactive model of data condensation, data display, and conclusion drawing. The analysis began with repeated reading of

interview transcripts, observation notes, and documents. The researcher then conducted open coding to identify initial meanings related to access, usability, service integration, librarian support, digital literacy, publication support, and repository use. The codes were grouped into broader categories, such as user barriers, service expectations, adaptive service components, scholarly communication needs, and institutional support. The final themes were used to construct the adaptive digital library service model.

The model development process was based on empirical findings and relevant theoretical concepts. The proposed model included several components: accessibility, user-centered service design, librarian-mediated research support, repository integration, information literacy support, digital interface quality, publication support, research data awareness, and continuous service evaluation. The model was developed to reflect the actual needs of academic library users and the service capacity of library staff. Through this procedure, the study can be replicated in other academic libraries with similar digital service characteristics, although findings may remain context-bound due to the qualitative case study design.

3. Results and Discussions

The findings show that the development of an adaptive digital library service model is closely related to how users experience access, guidance, scholarly communication, and institutional support. Based on interviews, observations, and document analysis, five main themes emerged: access to scholarly information, user experience in digital service use, librarian support in scholarly communication, integration of digital platforms, and the need for adaptive service evaluation. These themes describe not only technical aspects of digital library services, but also the social and academic meanings attached to them by students, lecturers, researchers, librarians, and system managers.

The first theme concerns access to scholarly information. Most student participants stated that digital library services helped them find academic sources more quickly, especially when working on assignments, theses, and research proposals. However, access was not always experienced as simple. Several students still relied on general search engines because they found the library database interface difficult to understand. One student explained, "I know the library provides e-journals, but sometimes I do not know which database I should use for my topic." This finding indicates that access is not only about the availability of digital resources. It also depends on users' ability to identify, search, and select relevant scholarly materials. This condition reflects the need for digital library services that combine technology access with information literacy support.

The second theme relates to user experience in using digital library platforms. Observations showed that users often faced difficulties in navigating catalog menus, repository pages, and subscribed journal databases. Some users stopped searching when login procedures, search filters, or access links were unclear. A lecturer stated, "The resources are available, but the path to reach them is sometimes too long. Users need a simpler route." This pattern shows that the usability of digital library systems strongly affects user engagement. A digital service that is rich in content may remain underused if users experience confusion, slow access, or limited guidance. The meaning of "adaptive service" in this context refers to a service that adjusts to different levels of user ability, academic needs, and digital literacy.

The third theme shows that librarians play an important role in supporting scholarly communication. Participants did not only expect librarians to provide books or database access. They also expected assistance in searching for indexed journals, using reference managers, checking similarity, submitting works to institutional repositories, and understanding publication ethics. A lecturer explained, "When I prepare an article, I need support in finding suitable journals and checking whether the journal is credible." Librarians also recognized this changing role. One librarian stated, "Users now ask about publication, citation, and repository submission. Our role

is broader than before.” This finding suggests that academic librarians are increasingly positioned as research partners who support the scholarly communication cycle.

The fourth theme concerns the integration of digital platforms. Documentation showed that the library already provided several digital services, including online catalog access, repository services, e-journal links, and digital reference channels. However, interviews revealed that users often perceived these services as separate systems. Students accessed the catalog for books, the repository for theses, and external databases for articles without understanding how these services were connected. One postgraduate student said, “I use the repository only when I need previous theses. I did not know it could also support research visibility.” This finding indicates that digital library services need stronger integration, both technically and communicatively. Users need a clear service pathway that connects searching, reading, writing, publishing, storing, and disseminating scholarly work.

The fifth theme relates to the need for continuous evaluation and adaptive improvement. Librarians and system managers acknowledged that user needs change over time, especially as academic publishing becomes more complex. However, service evaluation was often conducted informally through complaints, direct questions, or occasional feedback. A system manager explained, “We know users face problems when they ask directly, but we do not yet have a regular evaluation mechanism.” This finding shows that adaptive digital library services require structured feedback systems. User analytics, satisfaction surveys, consultation records, and participatory service design can help libraries understand changing needs more accurately.

The findings also show that digital library services are shaped by the academic culture of the institution. Students often use digital library services when lecturers require scholarly references. Lecturers use services when preparing publications, supervising students, or searching for research materials. Librarians provide support based on available skills, infrastructure, and institutional policies. This pattern shows that digital library use is not an individual activity only. It is influenced by teaching practices, research expectations, publication pressure, technological readiness, and institutional communication. Therefore, an adaptive digital library service model must connect users, librarians, digital platforms, and academic policy in one coherent service ecosystem.

Based on these themes, the proposed adaptive digital library service model consists of seven interrelated components: user-centered access, digital literacy support, integrated scholarly resources, librarian-mediated research assistance, repository and publication support, responsive technology infrastructure, and continuous service evaluation. These components reflect the main needs expressed by participants. The model places users at the center, but it also recognizes that effective digital services require librarian competence, platform integration, institutional support, and ongoing feedback. In this model, the library acts as a mediator between scholarly information resources and the academic communication practices of the university community.

Discussion

The findings confirm that digital library transformation cannot be understood only as a technological change. It is also a service, cultural, and institutional change. Users need platforms that are easy to access, but they also need guidance, interpretation, and academic support. This finding is consistent with Mehta and Wang (2020), who found that digital library services became essential for academic continuity during periods of disruption. It also supports Appleton’s (2021) argument that the digital shift in academic libraries requires new service strategies. In this study, the adaptive model emerged because users experienced digital library services as part of their academic routines, not merely as technical tools.

The finding on access barriers supports previous research on digital library adoption. Begum and Elahi (2022) found that digital library services can support online learning, but their

effectiveness depends on accessibility and user readiness. Kayode et al. (2020) also emphasized that ease of use and user-friendliness influence the adoption of web-based library services. The present study extends these findings by showing that access barriers are not limited to interface problems. They also involve user confidence, search habits, academic expectations, and limited knowledge of available services. Users may have access to databases, but they may still fail to use them effectively when service pathways are unclear.

The role of librarians in this study aligns with recent discussions on research support services. Awan et al. (2022) argued that university libraries need to support users across the research process. Hussain et al. (2025) also emphasized the importance of research support services across the research lifecycle. The present study confirms this view by showing that users expect librarians to assist not only with information retrieval, but also with publication, citation, repository use, and journal credibility assessment. This finding strengthens the idea that librarians in digital academic environments need to act as research facilitators and scholarly communication partners.

The findings on repository use and platform integration show that digital library services need better alignment with scholarly communication practices. Institutional repositories are often available, but users may still perceive them only as storage spaces for theses or institutional documents. This finding is related to Amanullah and Abrizah's (2023) study, which found that librarians' roles in research data management are still developing and require clearer service structures. Sheikh et al. (2023) also noted that research data management in academic libraries continues to evolve. The present study adds that repository services should not stand alone. They need to connect with publication support, research visibility, citation practices, and academic identity.

The adaptive service model developed in this study also supports user-centered library development. Digital services become meaningful when they respond to the real experiences of users. Lu et al. (2025) found that users' willingness to use digital library services is related to the quality of digital transformation. In the present study, users were more willing to use digital services when they received clear guidance, simple navigation, and relevant support for academic tasks. This finding suggests that user-centered design should not stop at interface improvement. It should include service communication, librarian mediation, training, feedback, and institutional integration.

The study offers a new perspective by framing digital library services as part of scholarly communication. Previous studies have often examined digital services, research support, or data management separately. This study shows that these elements are connected in everyday academic practice. Students search for references, lecturers prepare publications, researchers need credible sources, and librarians assist users across different stages of knowledge production. Therefore, an adaptive digital library service model should integrate access, literacy, publication support, repository use, and evaluation. This integrated view can help academic libraries move from fragmented digital services toward a more coherent scholarly communication ecosystem.

Theoretically, this study contributes to the development of user-centered digital library theory by showing that adaptation is shaped by interaction between users, systems, librarians, and institutional culture. The findings also contribute to scholarly communication studies by showing that libraries play a mediating role in knowledge production and dissemination. Practically, the findings suggest that academic libraries need to simplify digital service pathways, strengthen librarian competencies in publication support, improve repository communication, provide regular digital literacy programs, and develop structured feedback mechanisms. These steps can help libraries respond to user needs more effectively.

The findings also have implications for university policy. Digital library development requires institutional support, not only library-level initiatives. Universities need to recognize digital library services as part of research infrastructure. This includes budget support, staff training,

system integration, database access, and collaboration between libraries, research offices, faculties, and journal management units. Without institutional support, adaptive services may depend only on individual librarian initiative and may not be sustainable.

Future studies can expand this research by comparing digital library service models across several universities with different accreditation levels, technological capacities, and research cultures. Further research may also use mixed methods to measure the relationship between adaptive service quality and user engagement, publication productivity, or repository use. In addition, future studies can explore how artificial intelligence, research analytics, and personalized recommendation systems can support adaptive digital library services while maintaining ethical standards, privacy, and academic integrity.

4. Conclusions

This study concludes that the development of an adaptive digital library service model is essential for supporting scholarly communication in academic institutions. The findings show that digital library services are not only technical access points, but also academic support systems that connect users with scholarly resources, publication practices, repository use, digital literacy, and research assistance. Five major themes emerged from the data: access to scholarly information, user experience in digital platforms, librarian support in scholarly communication, integration of digital services, and continuous service evaluation. These themes indicate that effective digital library services must be user-centered, responsive, integrated, and supported by competent librarians and institutional policy.

The study contributes to the literature on digital library development by showing that adaptation depends on the interaction between users, librarians, digital platforms, and academic culture. Practically, the findings suggest that university libraries need to simplify service pathways, strengthen digital literacy programs, improve repository communication, develop publication support services, and establish regular feedback mechanisms. From a policy perspective, universities should position digital library services as part of research infrastructure, not only as supporting facilities. Future studies may compare adaptive digital library models across different universities or use mixed methods to examine the relationship between adaptive services, user engagement, publication productivity, and repository utilization.

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