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INNOVATIONS IN LIBRARY SERVICES AT MUHAMMADIYAH UNIVERSITY OF SINJAI TO SUPPORT THE ACADEMIC ENVIRONMENT IN THE SOCIETY 5.0 ERA

Uswatul Ilmi
Universitas Muhammadiyah Sinjai, Indonesia
E-mail: uswatulilmi@umsi.ac.id*

Aam Azatil Isma
Universitas Muhammadiyah Sinjai, Indonesia

Harianto
Universitas Muhammadiyah Sinjai, Indonesia

Nur Amalia
Universitas Muhammadiyah Sinjai, Indonesia

Indra Setya Permana
Universitas Muhammadiyah Sinjai, Indonesia

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Abstract
This study aims to analyze the forms of service innovation at the Muhammadiyah University of Sinjai (UMSi) Library, the implementation process in support of the academic environment, factors supporting and hindering transformation, user needs and expectations, and to formulate a service innovation model that is adaptable to the characteristics of private universities in the region. The research method employed was a qualitative approach using a case study design systematically guided by the Define, Measure, Analyze, Improve, and Control (DMAIC) framework. Data were collected through in-depth interviews with 16 informants—including the university president, the library director, five faculty members/academic staff, and nine active students—as well as through observation and documentation. The data were then analyzed using thematic analysis with the assistance of NVivo 12 Plus. The research results revealed five interrelated aspects: forms of service innovation (E-Library and E-Books, Digital Services, " " as well as Repositories and Digital Collections); factors supporting innovation; factors hindering innovation; the implementation of innovation in supporting academic activities; and user needs and expectations. The findings indicate that the implementation of these innovations is perceived to contribute to supporting student research activities and the teaching process, as well as enhancing the user experience through responsive librarian services, although the success of this transformation remains limited by constraints in internet network infrastructure, low digital literacy among some users, and the building's physical condition, which is not yet adequate. The novelty of this study lies in the formulation of the Library Service Innovation Model —an adaptive and cyclical model that links forms of innovation, supporting and inhibiting factors, implementation, and user feedback within a single cycle of continuous adaptation.

Keywords: library transformation, Society 5.0, digital services, case study, UMSi

INTRODUCTION

Advances in information technology have brought about significant transformations in society through various innovations that facilitate access to and the use of information in various fields (Ariyanti & Zulaikha, 2024). In the Society 5.0 era, libraries are required to adapt by integrating artificial intelligence, the Internet of Things (IoT), robotics, and other digital technologies to provide more effective, personalized, and relevant services (Utomo, 2019). This transformation also encourages university libraries to strengthen their role as dynamic centers of knowledge through the digitization of services (Ibrahim et al., 2023), the modernization of management systems, and the expansion of access to learning resources (Sentiana et al., 2024), so that modern libraries are no longer merely physical repositories but centers of intellectual activity and creativity (Harianto et al., 2023).

There is a fundamental difference between conventional digital transformation and service innovation within the Society 5.0 framework. Conventional digital transformation generally focuses on technical aspects, automation, expanding access to e-services, and document digitization solely for the sake of operational efficiency. In contrast, Society 5.0-based service innovation places people at the center (user-centered) (Bartoloni et al., 2022; Mourtzis et al., 2022), and are oriented toward the library's ability to create a collaborative and interactive service ecosystem based on users' real needs, while aligning digital technology with users' sociological readiness(Crihană & Rebenda, 2026)—in line with the view that integrating all parts of the organization into a single unit enables innovation to proceed efficiently and effectively (Lail & Isma, 2021). Therefore, the ideal library in the Society 5.0 era is required to provide digital technology-based services that are fast, easily accessible, and fully integrated with users' daily academic needs.

In the context of Muhammadiyah University of Sinjai (UMSi), the challenges of this transition are evident. As a private university in a regional area, UMSi has developed the basic foundations of digitization—an e-library, an institutional repository, and a library information system—but the implementation of advanced smart technologies such as AI, chatbots, and smart search remains suboptimal. Current services are still dominated by basic digitization and have not been fully integrated into the daily academic activities of students and faculty. This gap is exacerbated by sociological barriers such as low digital literacy among some users, limited internet infrastructure, and inadequate physical facilities—indicating that the development of service innovations at the regional level requires a transitional approach that does not focus solely on technological sophistication but rather on a deep understanding of users' readiness, needs, and experiences.

Previous research indicates that studies on library innovation have evolved from a focus on service automation toward the development of user-experience-based smart services, the integration of digital technology, and support for modern learning ecosystems. (Novida et al., 2024) explain that the digital transformation of libraries is not merely about the use of technology, but also a shift in services toward systems that are more adaptive, efficient, and user-oriented; the use of AI is considered capable of improving operational efficiency, information accessibility, service quality, and user experience through service automation, recommendation systems, chatbots, and digital collection management. (Connaway et al., 2022)

explain that digital library services need to be designed to be responsive and user-oriented to improve the service experience and participation among the academic community. Furthermore, (Islam et al., 2025) demonstrate that the use of AI in libraries has evolved from administrative and collection management functions toward supporting learning services, information retrieval, and academic research. These developments indicate that library service innovation in the Society 5.0 era is no longer merely about providing digital systems, but rather the ability to create a service ecosystem that is collaborative, interactive, and based on user needs.

In Indonesia, research on library innovation generally still focuses on the digitization of services, the development of information systems, and improving the efficiency of information access. (Maha & Rosiyan, 2021) emphasize that the development of library e-services is carried out to expand user accessibility through the optimization of information technology. Meanwhile, (Winastwan & Syarif, 2025) show that university libraries have begun to develop service innovations such as children's services, flexible service hours, scientific communication, and user-needs-based services as a form of adaptation to changes in the academic environment. However, most previous studies have focused on technical aspects and the outcomes of service implementation; consequently, research on the innovation process, institutional dynamics, strategies for sustainable service improvement, and the formulation of library service innovation models that are adaptive to the needs of the academic community remains relatively limited—especially since research on Society 5.0-based library service innovations at private universities in regional areas has not been extensively conducted.

The gap between the ideal concept of Society 5.0—rich in smart technologies—and the reality of basic digitalization, coupled with literacy barriers in the field, underscores the urgency of this research. Using a qualitative case study approach systematically guided by the Define, Measure, Analyze, Improve, and Control (DMAIC) framework, this study aims to analyze how service innovations are designed, implemented, and formulated to be adaptive to user characteristics in regional areas.

Through this systematic approach, the study is expected to make a tangible contribution beyond mere theory. Findings regarding the optimization of the provision of required textbooks, scientific journals, and digital repositories directly contribute to the achievement of SDG 4 (Quality Education) by expanding access to valid academic resources for students in rural areas.

Furthermore, findings regarding strategies to enhance librarians' proficiency in applying technology, as well as programs to address users' low digital literacy, will directly contribute to the realization of the Asta Cita, particularly the pillars of human resource development and mastery of science and technology within the national higher education sector and society at large.

RESEARCH METHOD

This study employs a qualitative approach using a case study design to gain an in-depth understanding of the service innovation process at the Muhammadiyah University of Sinjai (UMSi) Library in support of the academic environment in the Society 5.0 era. A qualitative approach was chosen because this study seeks to understand the phenomenon of service innovation contextually and holistically (Septiana et al., 2024), particularly regarding organizational dynamics, librarian-user interactions, and institutional conditions that influence service development. Using a case study design, the research focused on the specific context of

the UMSi Library as the unit of analysis to understand the forms of innovation, the implementation process, as well as the factors supporting and hindering service transformation.

Informants were selected through purposive sampling based on their involvement in managing or using library services and their experience with digital services, comprising 16 individuals: the Library Director, nine students, five faculty members/academic staff, and the UMSi Rector. The Library Director and the Rector provided managerial and policy perspectives, while students and faculty members represented user experiences with the e-library, the repository, and digital information sources.

Data were collected through in-depth interviews, observations, and documentation—interviews to explore forms of innovation, implementation processes, user needs, and supporting/hindering factors; non-participant observations of librarian-user interactions, facility/infrastructure conditions, and the accessibility of digital services; and documentation in the form of service usage data, application guides, policy documents, and facility records.

Data validity was ensured through source triangulation (comparing information across informants), methodological triangulation (confirming interview results with observations and documentation), and member checking with key informants to ensure the accuracy of the researchers' interpretations.

This study uses the DMAIC (Define, Measure, Analyze, Improve, Control) framework as both a service development model and an operational framework: Define to identify service needs and issues; Measure to assess the state of digital services; Analyze to identify enabling and inhibiting factors; Improve to formulate recommendations and innovation models; and Control to develop strategies for evaluating and sustaining innovations.

All data were analyzed using thematic analysis aided by NVivo 12 Plus through a process of coding, category grouping, theme identification, and interpretation of inter-theme relationships. The integration of case study approaches, triangulation, thematic analysis, and the DMAIC framework was used to generate a systematic understanding of UMSi Library's service innovations in supporting the academic environment in the Society 5.0 era.

RESULT AND DISCUSSION

Based on the results of data processing obtained through interviews, observations, and documentation—which were then analyzed using thematic analysis techniques—it was found that "Innovations in the Library Services of Muhammadiyah University of Sinjai in Supporting the Academic Environment in the Society 5.0 Era" is the main theme formed from five interrelated aspects. These five aspects illustrate how the process of library service innovation is not only oriented toward the utilization of technology but also takes into account user needs, organizational factors, and various challenges in its implementation.

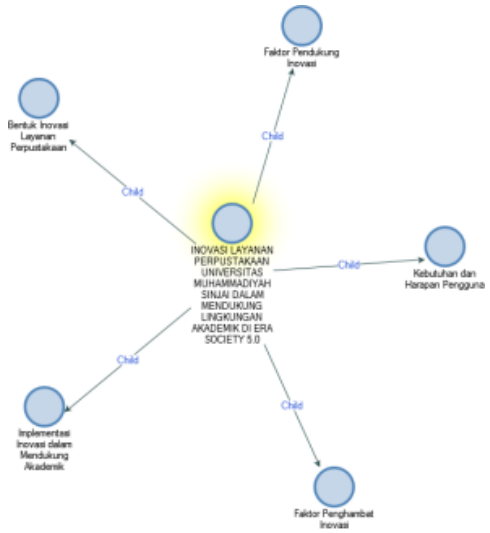


Figure 1. Results of Data Analysis on the Theme "Innovations in Library Services at Muhammadiyah University of Sinjai in Supporting the Academic Environment in the Society 5.0 Era."

Figure 1 shows that library service innovation is built through interrelated aspects that form a unified system. The first aspect relates to the forms of library service innovation, which describes the various digital and non-digital service innovations that have been developed as a means of adapting to technological advancements and the needs of the academic community. The second aspect is the implementation of service innovations in support of the academic environment, illustrating how these innovations are applied to facilitate learning, research, and community service activities.

Next, the third aspect is the factors supporting innovation, which include human resources, institutional policy support, the utilization of information technology, and collaboration that drives the success of service innovations. The fourth aspect is the factors hindering innovation, which explain the various challenges faced by libraries in the service transformation process, whether in terms of infrastructure, user digital literacy, or resource limitations. The fifth aspect is user needs and expectations, which reflect the academic community's expectations for the development of library services to become increasingly adaptive, responsive, and relevant to the characteristics of the academic environment in the Society 5.0 era.

The relationship among these five aspects demonstrates that library service innovation is a dynamic process. The forms of innovation developed must be effectively implemented with the support of various internal and external factors, be capable of overcoming various obstacles, and consistently prioritize user needs and expectations as the primary focus of service development.

Forms of Library Service Innovation

The results of the data analysis show that the service innovations developed by the Muhammadiyah University of Sinjai Library represent an effort to adapt to developments in information technology and the demands of the academic environment in the Society 5.0 era. Based on the data coding and categorization process, three main forms of innovation were identified: E-Library and E-Books, Digital Services, and Repositories and Digital Collections.

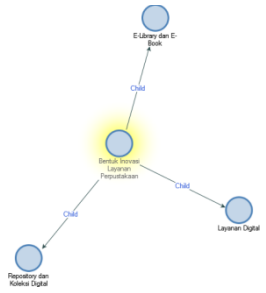


Figure 2. Forms of Library Service Innovation
Source: Processed by the researcher using NVivo 12 Plus, 2026

These three forms of innovation complement one another in building a more adaptive service ecosystem oriented toward user needs. E-Libraries and E-Books enable flexible access to information without time or location constraints; Digital Services reflect the transformation of service processes through the use of information technology to make librarian-user interactions more effective and efficient; while Digital Repositories and Collections serve as platforms for the storage, preservation, and dissemination of the institution's scholarly works, supporting the advancement of knowledge and UMSi's academic visibility. These findings indicate that library service innovation is not merely the implementation of digital technology but also a strategy to improve the quality of information services in response to changes in user behavior in the Society 5.0 era—marking the transformation of the library's function from a mere collection provider to a digital information service center that supports a more effective, collaborative, and technology-based academic environment.

The Rector (R1) emphasized that "Libraries must begin transitioning to an integrated digital system (e-library)." This statement reflects the recognition that libraries can no longer rely on conventional services but must develop an integrated service system so that users can access information sources more easily, quickly, and without restrictions on time or place.

The interview results also showed that innovation in digital services is not only determined by the existence of information systems but is also influenced by the readiness of the infrastructure and users' ability to utilize the technology. The Head of the Library (KP1) stated that "The library needs to expand its digital collection, improve facilities and internet connectivity, and provide training for students on how to optimally use digital services." This statement indicates that the success of digital service transformation requires adequate support from electronic collections, a stable internet connection, and the improvement of users' digital literacy through various training programs. The need to expand the digital collection also underscores the importance of developing an institutional repository as a medium for storing, preserving, and disseminating the scholarly works of the academic community, while simultaneously broadening access to research findings and enhancing UMSi's academic visibility. Thus, the development of the e-library, digital services, as well as the repository and digital collections constitutes a unified set of complementary innovations in realizing a library that is adaptive, responsive, and capable of supporting the learning process, research, and the advancement of knowledge in the Society 5.0 era.

When considered in light of the findings (Novida et al., 2024) —which emphasize that the digital transformation of libraries is not merely about the use of technology but rather a shift toward adaptive, efficient, and user-oriented services—the findings at the UMSi Library indicate only the initial stage of this shift. The three forms of innovation identified essentially remain at

the level of digitizing conventional services, namely the transition of collections and service processes to electronic formats. Society 5.0 demands more than that; (Champla, 2026; Ugochukwu Francis Ikwuanusi et al., 2023) indicate that the use of AI in libraries should ideally lead to personalized services through recommendation systems, chatbots that address users' specific needs, and analytics that support intelligent search. Meanwhile, UMSi's e-library and repository have yet to demonstrate system intelligence features (such as automatic recommendations or adaptive search) or cross-platform integration that directly links student and faculty academic data with library services. This gap underscores the distance between the innovations UMSi has achieved and the ideal characteristics of Society 5.0 services, which are marked by integration, personalization, system intelligence, and collaboration. The contribution of these findings lies in mapping this transition phase: UMSi is in the integrated digitization phase, which serves as the foundation for moving toward intelligent and personalized services; therefore, strengthening system intelligence and service personalization must be prioritized as the next direction for development.

Factors Supporting Innovation

The results of the data analysis show that the success of service innovation at the Muhammadiyah University of Sinjai Library is supported by four main factors: technology adaptation, collection availability, understanding of user needs, and human resources (HR) and service delivery. These four factors are interrelated in creating library services capable of meeting the needs of the academic community while adapting to technological advancements in the Society 5.0 era.

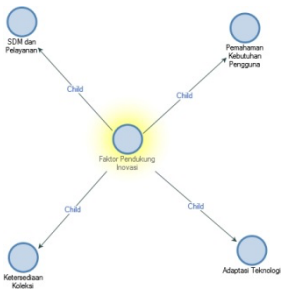


Figure 3. Factors Supporting Innovation
Source: Processed by the researcher using NVivo 12 Plus, 2026

One of the most dominant factors is technological adaptation. Lecturer (D1) stated that "Libraries must continuously innovate technologically, regularly update their service systems, and always keep pace with evolving user needs to remain relevant in the digital age." This statement indicates that service innovation is an ongoing process that does not end with the mere implementation of technology; libraries are required to continuously update their service systems to adapt to changes in user behavior, as users increasingly rely on digital technology.

In addition to technological adaptation, the availability of the collection also supports the success of service innovation. Lecturer (D2) stated, "In my opinion, the library's services are already very supportive by providing required textbooks for courses and several necessary journals." This finding indicates that a collection aligned with academic needs is one of the library's key strengths in supporting the learning process.

The next factor is understanding user needs. One faculty informant (D3) expressed the hope that "I hope the library can improve its infrastructure and facilities, expand its collection

to meet the department's needs, and enhance the quality of its services to better support students' academic activities." This statement underscores that the development of innovative services must be grounded in users' actual needs—not merely technology-driven but also rooted in an understanding of the characteristics and information needs of the academic community.

In addition, human resources and service delivery are equally important supporting factors. A faculty member (D4) stated that "Library staff must keep up with existing technologies, such as the applications being used." This statement indicates that librarians' competencies must evolve alongside technological advancements so they can effectively manage digital services and provide optimal support to users.

Overall, the success of service innovation at the UMSi Library is determined not only by the availability of digital technology but also by the library's ability to provide relevant collections, understand user needs, and be supported by human resources that are adaptable to technological developments—forming a complementary innovation ecosystem that supports the academic environment in the Society 5.0 era.

Findings regarding technology adaptation, collection availability, understanding of user needs, and staff competencies align with the view (Connaway et al., 2022) that digital library services must be designed to be responsive and user-oriented to increase academic community participation. However, while (Connaway et al., 2022) emphasize the importance of user search behavior data as the foundation for designing responsive services, the enabling factors at UMSi still rely primarily on the readiness of human resources and basic infrastructure and have not yet addressed the systematic use of user data for service personalization. This gap indicates that the enabling factors for innovation at UMSi remain focused on input readiness (technology, collections, human resources) and have not yet evolved into data-driven capabilities that allow services to automatically adapt to the individual needs of users. These findings confirm that supporting factors are hierarchical: human resource and infrastructure readiness are fundamental prerequisites that must be met first before the library can move toward the intelligent and personalized services envisioned within the Society 5.0 framework.

Factors Hindering Innovation

The results of the data analysis indicate that the service innovation process at the Muhammadiyah University of Sinjai Library still faces various obstacles that affect the optimal implementation of services. Based on the results of data coding, the barriers to innovation include technological infrastructure, limited collections, a lack of outreach, digital literacy, and the library's location. These five factors are interrelated and affect the effectiveness of service utilization by the academic community.

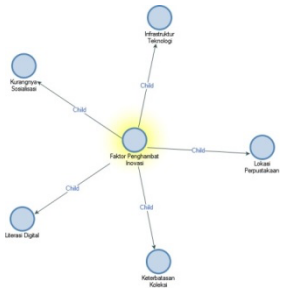


Figure 4. Factors Hindering Innovation
Source: Processed by the researcher using NVivo 12 Plus, 2026

One of the main barriers is limited technological infrastructure. Although the library has developed various digital-based services, the quality of internet connections and the ease of using the system remain obstacles for some users. A faculty member (D5) stated, “As a user, I still face difficulties, particularly in operating the service system and with limited internet access.” This statement indicates that the availability of digital systems has not yet been fully supported by adequate infrastructure.

In addition to technological infrastructure, limitations in the collection also hinder service innovation. A student (M1) stated, “In my opinion, current library services do not yet fully support my coursework and research activities. This is due to the limited available collection, particularly references relevant to my field of study or major.” This statement underscores that the relevance and comprehensiveness of the collection are crucial aspects in supporting learning and research; when needed references are unavailable, users tend to seek information sources outside the library.

Another obstacle is the lack of outreach regarding the services that have been developed. Student (M2) stated, “The lack of outreach, limited internet access, and users’ limited technological understanding are the main factors preventing these services from being utilized to their full potential.” This statement indicates that the success of innovation depends not only on the availability of technology but also on the effectiveness of communicating information to users.

Research findings also indicate that users’ digital literacy remains a challenge in implementing service innovations. Some students still require guidance in using digital services, so their utilization is not yet optimal. Training in the use of digital services and information literacy activities are expected to enhance users’ competencies.

In addition to technological and user-related factors, the library’s location also poses a barrier. The condition of the building and its location, which are considered inadequate, affect ease of access and user comfort. Student (M3) stated, “I recommend that Muhammadiyah University of Sinjai build a library building that is more presentable and easily accessible to students.” This statement indicates that the development of service innovations must not only focus on digital aspects but also be supported by adequate physical facilities.

Overall, the barriers to service innovation at the UMSi Library stem from a combination of technological factors, information resources, user capabilities, communication strategies, and physical facilities. Therefore, efforts to drive innovation must be carried out comprehensively through improvements to technological infrastructure, the development of collections tailored to user needs, the optimization of service outreach, the enhancement of digital literacy among the academic community, and the provision of a more representative library building.

The five identified barriers do not exist in isolation but reinforce one another in a chain of cause and effect. Limitations in technological infrastructure are the root cause that directly impacts the low intensity of digital service usage; an unstable internet connection discourages users from trying new services, which in turn slows the dissemination of service information (lack of outreach) and hinders the improvement of digital literacy because opportunities to practice using the system are limited.

In other words, infrastructure barriers are not merely one factor on par with others, but rather the root cause that triggers a chain reaction of literacy and outreach barriers. This pattern aligns with the findings (Maha & Rosiyan, 2021) which indicate that library e-service innovations are often hindered by the gap between the availability of technology and the practical readiness to use it. However, the study (Maha & Rosiyan, 2021) highlights barriers at

the policy and institutional risk management levels, whereas at UMSi, the barriers stem primarily from the condition of physical infrastructure (networks and buildings) that lies outside the direct control of library administrators. These findings suggest that strategies to overcome these barriers cannot be applied simultaneously across all five factors; rather, they must begin with strengthening the technological infrastructure as the primary focus, which will subsequently alleviate the resulting barriers.

Implementing Innovation to Support Academic Activities

The results of the data analysis show that the implementation of service innovations at the Muhammadiyah University of Sinjai Library provides benefits in supporting the academic activities of the university community. Based on the results of data coding, this implementation is realized through four main aspects: research support, teaching process support, contributions to academic development, and enhancement of the user experience.

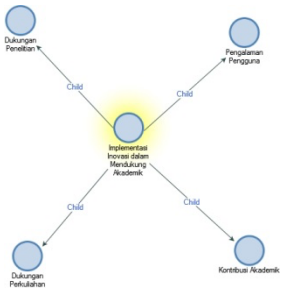


Figure 5. Implementation of innovations in support of academic activities
Source: Processed by the researcher using NVivo 12 Plus, 2026

The implementation of service innovations is evident in its role in supporting student research activities. The various available services—book collections, theses, and other reference sources—make it easier for students to obtain the information they need. A student (M4) stated, "Library services are very helpful in providing references in the form of books and theses needed to support the completion of coursework and student research activities." This statement underscores the library's crucial role as a provider of scientific information sources that support the improvement of research quality.

In addition to supporting research, the implementation of service innovations also contributes to the teaching and learning process. Student (M5) stated, "Its contribution is quite significant, because the library is the primary source for students seeking academic reference materials." This statement indicates that the library continues to play a strategic role in supporting the learning process by providing the references students need.

The research findings also indicate that service innovations contribute to the overall academic development of UMSi, not only by helping students complete their academic assignments but also by enhancing the quality of learning, research, and the university's academic development.

The implementation of these innovations is also reflected in users' positive experiences. In addition to technology-based services, the quality of librarians' service and the comfort of the library environment also influence user satisfaction. A student (M6) stated, "So far, my experience has been quite good and satisfying. The library staff are friendly and very helpful when I have trouble finding a book. The atmosphere in the room is also quite quiet and comfortable for group study or working on assignments alone." This statement indicates that

the user experience is influenced by a combination of service quality, ease of access to information, and the comfort of the facilities.

Overall, the implementation of service innovations at the UMSi Library has provided tangible support for academic activities through the provision of research references, support for the teaching process, contributions to academic development, and improvements in the user experience. These four aspects complement one another in strengthening the library's function as an adaptive, user-oriented information resource center that supports higher education in the Society 5.0 era.

Findings regarding the contribution of services to research, teaching, academic development, and the user experience reinforce the view (Winastwan & Syarif, 2025) that university libraries are beginning to develop user-needs-based services as a form of adaptation to changes in the academic environment. However, implementation at UMSi remains focused on providing references and ensuring librarian service courtesy, and has not yet addressed more active forms of collaboration, such as the library's involvement in the research mentoring process or integration with the campus academic information system. In fact, services that reflect the Society 5.0 ecosystem, as emphasized by (Okhovati et al., 2026), should position the library as an active partner in the research process, not merely a provider of resources. This gap indicates that the implementation of innovation at UMSi remains at the level of passive support (providing access), rather than active collaboration (involvement in academic processes). These findings underscore the need for a shift in the library's role—from an information provider to a collaborative partner in the learning and research ecosystem.

User Needs and Expectations

The results of the data analysis indicate that users have high expectations for the development of the Muhammadiyah University of Sinjai Library's services to become more adaptive to technological advancements and academic needs in the Society 5.0 era. Based on the results of data coding, users' needs and expectations focus on three main aspects: collection expansion, the development of digital services, and the realization of an ideal library aligned with the characteristics of the Society 5.0 era.

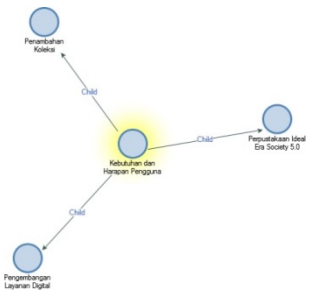


Figure 6. User Needs and Expectations
Source: Processed by the researcher using NVivo 12 Plus, 2026

One of the most frequently expressed expectations by users is the expansion of the collection, particularly digital collections relevant to academic needs. A student (M7) stated, "I hope the library becomes more modern with a more comprehensive digital collection, a faster service system, and ease of access that all students can experience." This statement indicates that user needs are no longer limited to print collections but have shifted toward digital collections that are more comprehensive, up-to-date, and easily accessible.

In addition to expanding the collection, users also expect the development of more innovative digital services. A student (M8) recommended, “My recommendation is to immediately launch or optimize a campus-specific digital library app.” This statement reflects users’ desire for library services that can be accessed via digital devices, so that the processes of searching for information, borrowing materials, and accessing references can be carried out more easily and efficiently.

Users also have a vision for the ideal library in the Society 5.0 era. Student (M9) stated that “The ideal library in the Society 5.0 era is one that is based on digital technology, provides services quickly, is easily accessible anytime and anywhere, and is fully integrated with users’ academic needs.” This statement emphasizes that library transformation in the Society 5.0 era must be user-oriented, with digital technology serving as a means to enhance service quality.

Overall, users’ needs and expectations regarding the UMSi Library point toward the development of a more modern library through the expansion of digital collections, the optimization of technology-based services, and the establishment of a service system integrated with academic needs. These expectations serve as crucial input for library administrators in designing service development strategies that are more adaptive, innovative, and oriented toward the needs of the academic community.

Users’ expectations regarding the expansion of digital collections, integrated library applications, and fast, easily accessible services align with the characteristics of user-oriented digital services as described (Adascalitei Macari, 2025; Rastogi & Rai, 2026). However, these expectations essentially remain at the level of basic needs (basic digital access) and have not yet touched on the aspect of personalization that characterizes Society 5.0, such as automated reading recommendations based on borrowing history or proactive notifications regarding new references relevant to the user’s field of study. This gap is understandable given that the development of UMSi’s services is still in the basic digitization phase, so user expectations are shaped by their experiences with currently available services. These findings indicate that user expectations can serve as a roadmap for the gradual development of services, moving from the fulfillment of basic needs toward more advanced service personalization.

Formulation of the Library Service Innovation Model

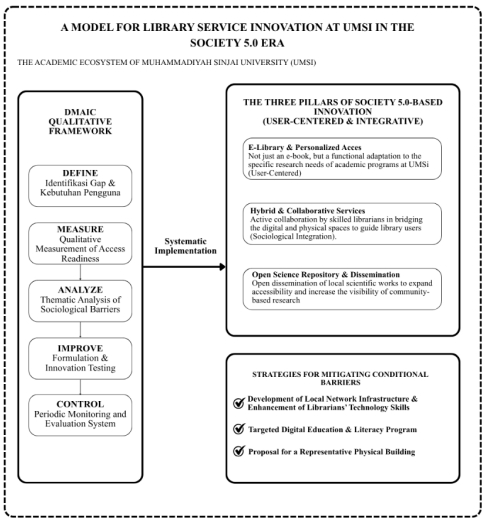


Figure 7. UMSi Library Service Innovation Model in the Society 5.0 Era
Source: Researchers

Based on the interrelationships between forms of innovation, enabling factors, barriers, implementation, and user needs and expectations as outlined above, this study formulates an adaptive and cyclical library service innovation model. This model consists of four interrelated stages. First, the innovation form development stage (E-Library, Digital Services, Repository), driven by supporting factors such as technological readiness, collections, understanding of user needs, and human resource competencies. Second, the implementation stage, where these forms of innovation are translated into tangible support for research, teaching, and the user experience, yet are simultaneously constrained by inhibiting factors that act as filters determining how optimally the implementation can proceed. Third, the needs evaluation stage, where user needs and expectations arising from their experience using the services serve as feedback for library administrators. Fourth, the readaptation stage, where this feedback drives the development of new, more advanced forms of innovation—for example, moving beyond mere digitization of collections toward personalization and system integration—so that the cycle repeats at the first stage with a higher level of innovation. This model emphasizes that barriers are not merely obstacles to be eliminated, but rather an integral part of the cycle that determines the speed of the library's transition toward Society 5.0 service characteristics—fully integrated, personalized, intelligent, and collaborative.

CONCLUSION

This study confirms that the transformation of the UMSi Library within the Society 5.0 framework is realized through three main innovations: e-libraries and e-books, digital services, and institutional repository optimization. These innovations transform the library from a provider of physical collections into an adaptive, collaborative, and user-oriented digital information service center. They contribute to the academic ecosystem by providing accessible research references, supporting teaching, and enhancing user experience through responsive librarian services. Their success is influenced by technological adaptability, collection relevance, and human resource competencies. However, optimization remains constrained by limited internet infrastructure, low digital literacy among some users, insufficient outreach, and inadequate physical facilities. Therefore, sustainable library innovation requires an integrated approach combining technological readiness, user capacity, and supporting facilities.

Theoretically, this study contributes an adaptive and cyclical Library Service Innovation Model consisting of four interrelated stages: innovation development, implementation, needs assessment, and readaptation. The model addresses a gap in previous research that largely focused on technical aspects and implementation outcomes without formulating an innovation model responsive to the changing needs of academic communities, particularly at private universities in regional areas. Unlike linear digitization, the model positions obstacles as part of the innovation cycle that encourages libraries to move beyond collection digitization toward integrated, personalized, intelligent, and collaborative services characteristic of Society 5.0. It can therefore serve as a conceptual framework for further research in universities with similar resource and user characteristics.

SUGGESTION

Future library development should prioritize technological infrastructure, including improved internet connectivity and a campus-specific digital library application integrated with the academic system. Libraries should also expand relevant and up-to-date digital collections

according to academic program needs, strengthen students' digital literacy through intensive service outreach, and improve librarians' IT competencies through training. These efforts should be accompanied by modernization of physical facilities to create a representative and comfortable library as a hub of intellectual activity.

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