



Web-based knowledge sharing in Indonesian higher education to enhance students' and lecturers' knowledge capacity

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Article Info

Article history:

Received June 11, 2026

Revised July 03, 2026

Accepted August 12, 2026

Available online August 17, 2026

Keywords: ADDIE Model, Collaborative learning, Higher Education, Knowledge capacity, Knowledge sharing, Web-based

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Abstract. This research aims to develop and evaluate a web-based knowledge sharing model designed to increase the knowledge capacity of students and lecturers. Effective knowledge sharing is essential to support collaborative learning and improve access to information in academic environments. The study employed the Research and Development (R&D) method with the ADDIE model to design and evaluate a platform integrating a content management system (CMS), discussion forums, a question and answer feature, and project collaboration spaces, while analyzing user interaction data to identify usage patterns and content preferences. Results show that the platform successfully increased user engagement, expanded access to information, and strengthened connections between students and lecturers. Functionality testing achieved an 86.7% success rate, system uptime reached 98%, and average user satisfaction was 4.2 out of 5. Expert validation confirmed a

"very valid" rating across all dimensions. Paired sample t-test analysis revealed a significant difference between pre-test and post-test scores (Sig. 0.000 < 0.05), with a gain score of 0.56 (medium category). These findings confirm that the model effectively enhances users' knowledge capacity and academic collaboration, and is recommended as a reference for higher education institutions in developing more effective, technology-based collaborative learning strategies.

Introduction

In the last few decades, digital transformation has changed various aspects of life, including in the field of education. Universities around the world are beginning to adopt web-based technologies as part of efforts to improve the quality of education and encourage more effective academic collaboration. One of the innovations that emerged from this transformation is web-based knowledge sharing, which allows access to knowledge resources more easily and efficiently. (Martin & Bolliger, 2022) highlight the importance of knowledge sharing in enhancing collaborative and innovative capabilities in the academic environment, especially among students and lecturers who depend on knowledge exchange to increase their understanding and capabilities in various fields of study.

In the academic environment, web-based knowledge sharing not only facilitates the distribution of knowledge, but also allows various parties to access information in real time and across locations. This is very important in the era of globalization, where students and lecturers are often involved in collaborations involving institutions or individuals in various geographic

locations (Mustapha et al., 2023). Furthermore, the web-based knowledge sharing model offers unlimited flexibility in time and place, thus enabling more dynamic learning (Achmadi & Siregar, 2021). Web-based platforms allow students to study independently while participating in discussions or collaboration with peers and lecturers through online forums, video conferencing, and sharing digital materials.

Research conducted by Padayachee & Moodley (2022) shows that web-based knowledge sharing not only facilitates access to knowledge, but also strengthens collaboration between students. Students who are active in knowledge sharing activities tend to understand the material more quickly and have better critical thinking skills. Additionally, web-based knowledge sharing platforms enable lecturers to provide more effective feedback and guidance to students, which has been shown to improve students' academic outcomes and research abilities (Al-Jedaiah, 2020; Mariana et al., 2025). Another study conducted by Zulaikha et al. (2025) found that the use of web-based platforms can reduce gaps in access to knowledge between individuals with different backgrounds, thereby allowing all users to have equal learning opportunities.

However, challenges in implementing web-based knowledge sharing remain significant, especially related to technological constraints and users' digital capabilities. The main challenge universities face in implementing web-based knowledge sharing is the lack of digital skills among users, both lecturers and students. In addition, differences in technology access, such as internet network quality, can also affect the platform's effectiveness (Motik & Ridwan, 2025). To overcome these obstacles, adequate technological support and training are needed to increase students' and lecturers' digital literacy. Meanwhile, individual motivation in sharing knowledge also plays an important role in the successful implementation of web-based knowledge sharing. Research by Vuori & Okkonen (2012) shows that motivation, both intrinsic and extrinsic, greatly influences participation in knowledge sharing. An environment that supports collaboration, incentives, and ease of use are significant factors in encouraging users to actively share knowledge. High motivation to share knowledge can increase collective understanding, which is important in a collaborative and interdisciplinary academic environment (Widana et al., 2023).

In addition, data security and privacy are also concerns in developing web-based knowledge-sharing models. Students and lecturers must be confident that the information and data they share will remain safe and not be misused. According to Motik & Ridwan (2025), an adequate security system is very necessary in web-based platforms to build user trust and increase participation in knowledge sharing. A successful knowledge-sharing system can guarantee information security and prevent data leaks that threaten user privacy (Bharot et al., 2025). Furthermore, the quality of content on web-based knowledge-sharing platforms also influences learning effectiveness in higher education. Research suggests that content that is relevant, accurate, and aligned with the academic needs of students and lecturers is more likely to be used actively in the learning process. With high-quality content, web-based platforms can become the main source for students to prepare course materials and research assignments (Syamsiar et al., 2023). In addition, the ease of finding and accessing relevant content allows students and lecturers to maximize the time and energy they allocate for learning.

The problem in this research focuses on limited access and effectiveness of knowledge exchange in higher education, especially in regions such as East Nusa Tenggara (NTT), where technological infrastructure is still limited, and digital skills are not evenly distributed among students and lecturers. The low level of active participation in knowledge sharing is also an obstacle, caused by a lack of motivation, incentives, and concerns about the privacy and security of data shared on digital platforms. This limitation hinders knowledge exchange that should enrich the learning process and academic collaboration in higher education. To address these problems, this research

aims to develop a web-based knowledge-sharing model that increases accessibility, security, and motivation for students and lecturers to share and access knowledge more effectively and collaboratively.

Although numerous studies have addressed the effectiveness of web-based knowledge sharing, most have focused on evaluating platform usage or its direct impact on learning outcomes, without developing a systemically integrated and comprehensively validated model. Previous research has often neglected content management, system security, user analytics, and motivational strategies as standalone components, and thus has not presented a comprehensive digital ecosystem framework.

Based on this understanding, this study repositions web-based knowledge sharing as a digital knowledge ecosystem systematically designed to enhance the knowledge capacity of students and lecturers. The novelty of this research lies in integrating these four components into a cohesive, systematically tested model, rather than simply offering them as add-on features for existing platforms. Unlike previous studies, which have generally been evaluative, focusing on measuring the impact of established platforms, this research is generative and R&D oriented; it involves designing, developing, and validating a new model using the ADDIE approach and testing it within the context of Indonesian higher education, specifically in regions with limited infrastructure, such as NTT, which have rarely been the focus of similar prior research.

Method

This research uses a Research and Development (R&D) approach with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model to develop a web-based knowledge-sharing model aimed at increasing the knowledge capacity of students and lecturers. The R&D approach using the ADDIE model is considered appropriate because this research not only studies, but also produces new models or products that are ready to be implemented and tested in higher education (Spatioti et al., 2022). The ADDIE model was selected for its systematic and iterative nature, which allows continuous refinement based on user feedback and expert validation at each stage of development. This design ensures that the product is both pedagogically sound and technically functional before full-scale implementation.

Participants and Sampling Technique

The participants of this study consisted of lecturers and students from STIKOM Uyelindo Kupang who were involved in the preliminary needs analysis phase of the R&D study. Research by Ade Rahayu (2025) emphasizes the importance of collecting initial data in R&D methods using the ADDIE model to ensure that the product being developed is appropriate to user and contextual needs. The preliminary study aimed to identify users' perceptions, needs, and challenges related to web-based knowledge sharing in higher education. Data were collected through questionnaires and semi-structured interviews to obtain comprehensive information regarding existing knowledge sharing practices and expectations toward the proposed model.

A purposive sampling technique was employed to select participants who had relevant experience in using web-based learning and communication platforms. The inclusion criteria for lecturers were: (1) actively teaching during the research period, and (2) having experience utilizing digital platforms to support teaching and knowledge sharing activities. The inclusion criteria for students were: (1) actively enrolled in their respective study programs, and (2) having experience using web-based learning systems, such as Learning Management Systems (LMS), academic portals, or online collaboration platforms.

A total of 125 participants were involved in the study, comprising 25 lecturers and 100 students from three study programs: the Bachelor of Information Systems, Bachelor of Informatics Engineering, and Diploma (D3) Informatics Engineering programs. Table 1 presents the distribution of participants.

Table 1. Distribution of Research Participants

No	Participant Category	Study Program	Number	(%)
1.	Lecturers	Bachelor of Information Systems	8	6.4
2.	Lecturers	Bachelor of Informatics Engineering	11	8.8
3.	Lecturers	Diploma (D3) Informatics Engineering	6	4.8
4.	Students	Bachelor of Information Systems	30	24.0
5.	Students	Bachelor of Informatics Engineering	45	36.0
6.	Students	Diploma (D3) Informatics Engineering	25	20.0
Total			125	100.0

Before data collection, participants were informed about the study's purpose and provided voluntary consent. Participation was anonymous, and all responses were treated confidentially and used solely for research purposes.

Research Setting and Time Frame

This study followed the five stages of the ADDIE instructional design model, namely Analysis, Design, Development, Implementation, and Evaluation. During the Analysis stage, the researchers conducted a needs assessment to identify the digital infrastructure, the digital competencies of students and lecturers, and existing knowledge-sharing practices at STIKOM Uyelindo Kupang. Data were collected through questionnaires and semi-structured interviews with 125 participants, and the findings formed the basis for designing the proposed web-based knowledge-sharing model.

In the Design stage, the team developed an initial prototype based on the needs analysis results. The design focused on key components, including knowledge-sharing features, data security mechanisms, user-friendly navigation, and accessibility, while incorporating essential elements of successful technology-based knowledge sharing, such as ease of use, interactive features, and privacy protection (Mariani et al., 2026). During the Development stage, the model was implemented as a functional web-based platform equipped with a content management system, discussion forums, Q&A facilities, project collaboration spaces, a gamification system, and user analytics, and was deployed on the institutional server.

Following expert validation and revisions, the Implementation stage involved deploying the platform across three study programs at STIKOM Uyelindo Kupang. Lecturers and students used the system for two weeks during the pilot trial and for six weeks during the full implementation phase. Finally, the Evaluation stage assessed the model's effectiveness through expert validation, functionality testing, reliability testing, user acceptance testing, and statistical analysis using a paired-sample *t*-test. The evaluation results were used to determine the model's effectiveness in improving the knowledge capacity of students and lecturers.

Data Collection Techniques and Research Instruments

This study used multiple instruments to collect comprehensive information on the effectiveness and usability of the developed web-based knowledge-sharing model. Table 2 presents the instruments used.

Table 2. Research Instruments

No	Instrument	Purpose	Respondent	Scale
1.	Needs Analysis Questionnaire	Identify user needs and challenges	125 participants	Likert 1–5
2.	Semi-structured Interview	Explore perceptions and expectations	Selected participants	Open ended
3.	Expert Validation Sheet	Assess model validity	4 experts	Likert 1–4
4.	Functionality Test Checklist	Evaluate feature performance	Researcher/tester	Yes/No
5.	User Acceptance Questionnaire	Measure user satisfaction	40 participants	Likert 1–5
6.	Pre-test and Post-test	Measure knowledge capacity improvement	30 students	0–100

Instrument Validity and Reliability Testing

The researchers assessed the validity of the research instruments through content validity by four subject matter experts (two in educational technology and two in information systems). Experts evaluated each item for relevance, clarity, and alignment with the research objectives. Items that did not meet the validity threshold were revised or removed based on expert recommendations.

We tested the reliability of the questionnaire instruments using Cronbach's alpha, with a minimum acceptable threshold of 0.70. The needs analysis questionnaire yielded a Cronbach's Alpha value of 0.84, while the user acceptance questionnaire obtained 0.87, both indicating good internal consistency. The expert validation sheet was assessed for interrater reliability, with a Cohen's Kappa coefficient of 0.82, indicating strong agreement among the validators. These results confirm that the instruments used in this study are both valid and reliable for measuring the intended constructs.

Data Analysis Techniques and Criteria

This study employed both quantitative and qualitative data analysis approaches. Expert validation data were analyzed descriptively by calculating the percentage score for each validation aspect. The validity criteria were categorized as follows: 81%–100% = Very Valid, 61%–80% = Valid, 41%–60% = Less Valid, and 0%–40% = Not Valid (Spatioti et al., 2022). System functionality was evaluated by calculating the percentage of features that functioned well using the formula: Success Percentage = (Number of Features Functioning Well / Total Features Tested) × 100%, while system reliability was assessed based on uptime percentage and failure rate during load and stress testing.

User acceptance was analyzed by calculating the average satisfaction score of all respondents across five aspects, namely ease of use, access speed, security, feature effectiveness, and overall satisfaction, using a five-point Likert scale. In addition, the Net Promoter Score (NPS) was calculated to measure users' willingness to recommend the platform. To assess the model's effectiveness, a paired-sample t-test was performed to examine significant differences between pre-test and post-test scores. Furthermore, the normalized gain score was calculated using the

formula: $\text{Gain Score} = (\text{Post-test Score} - \text{Pre-test Score}) / (\text{Maximum Score} - \text{Pre-test Score})$ to measure the magnitude of improvement in participants' knowledge capacity. The gain score was interpreted as High ($g > 0.7$), Medium ($0.3 \leq g \leq 0.7$), or Low ($g < 0.3$), following the criteria proposed by Spatioti et al. (2022).

Product Specification

The product developed in this study is a web-based knowledge sharing platform designed to facilitate knowledge exchange among lecturers and students. The platform is accessible through desktop and mobile browsers using a responsive web design. It was developed using HTML5, CSS3, and JavaScript (Bootstrap framework) for the front end, while PHP and MySQL were used for the back end and database management. The system is hosted on STIKOM Uyelindo Kupang's institutional server.

The platform integrates several core features, including a Content Management System (CMS) for uploading, organizing, and sharing academic resources such as articles, videos, PDF files, and presentations; discussion forums and Q&A facilities to support synchronous and asynchronous interactions; project collaboration spaces; a gamification system featuring badges, points, and leaderboards; a user interaction analytics dashboard; two-factor authentication and data encryption for enhanced security; permission-based access control; and an intelligent content recommendation system based on user preferences. The system supports up to 200 simultaneous users with stable performance and can accommodate up to 250 users with only minor response delays. Role-based permissions manage access by differentiating administrators, lecturers, and students, while allowing users to manage private and public content according to their access rights.

Result and Discussion

Model Design and Interface

The web-based knowledge sharing platform was developed to support academic interaction and collaboration between students and lecturers at STIKOM Uyelindo Kupang. The system architecture follows a layered model consisting of: (a) User Authentication and Security Layer, which verifies user identity before granting access; (b) Platform Core, which manages content, interactions, and user data; (c) Content Repository, for storing and organizing academic materials; and (d) Feedback and Analytics Module, which collects and processes user interaction data to generate personalized recommendations. Image 1 depicts the overall system flow.

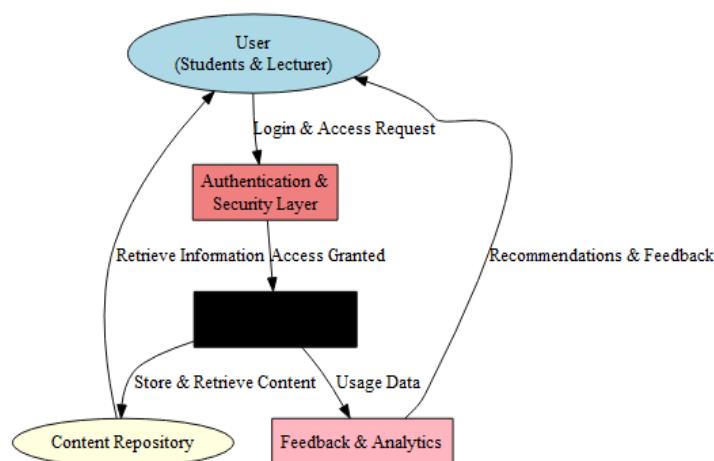


Image 1. Developed Model

The user interface was designed for easy navigation, with intuitive menus that allow users (students and lecturers) to access key features, such as content upload, search, and discussion forums (see Image 2). A friendly and easy-to-use user interface is essential to attract active participation. Responsive design makes it easier to access from mobile devices, a feature rated positively by 88% of respondents. The interface was specifically designed to be visually clean and low-bandwidth friendly, addressing the limited internet connectivity conditions common in East Nusa Tenggara.

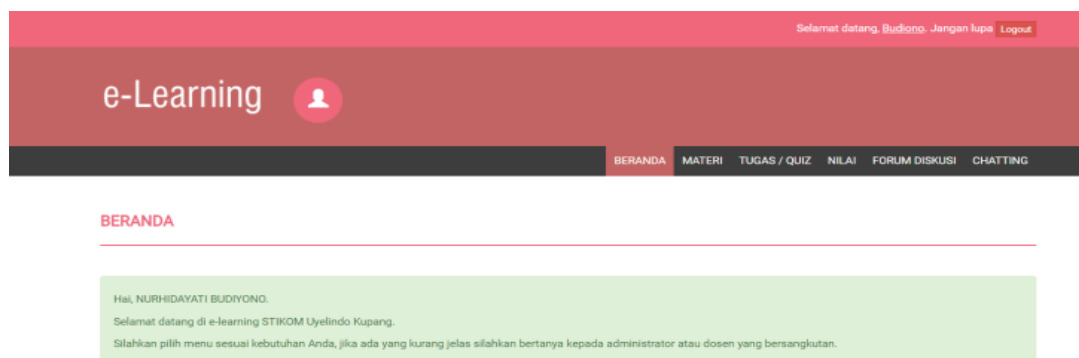


Image 2. Developed System Interface

Expert Validation Results

Before the model was tested in the field, expert validation was conducted to evaluate the feasibility, validity, and effectiveness of the design. The validation process involved four experts: a learning instrument expert, a learning material expert, a learning design expert, and a learning outcome measurement expert. All experts were selected based on their academic qualifications and professional experience in educational technology and information systems. The validation results are presented in Table 3.

Table 3. Overall Expert Validation Results

No	Validation Subject	Score Obtained	(%)	Category
1.	Expert validation of learning instruments	8 (max. 8)	100%	Very Valid
2.	Validation of learning materials	73 (max. 75)	97.33%	Very Valid
3.	Validation of learning design	78 (max. 85)	91.76%	Very Valid
4.	Validation of learning outcome measurements	79.6 (max. 86)	92.31%	Very Valid

As shown in Table 3, all four validation aspects received scores in the "Very Valid" category (above 81%), confirming that the web-based knowledge sharing model meets the required standards of educational product validity. These results are consistent with findings, who emphasized that rigorous expert validation is a prerequisite for ensuring the pedagogical and technical soundness of web-based learning platforms. The high validation scores, particularly for learning material content (97.33%) and learning instrument (100%), suggest that the model successfully aligns its content and assessment tools with the academic needs of the target users.

Functionality and Reliability Test Results

Functionality tests revealed that most of the features in the web-based knowledge sharing platform function well according to specifications. Of the total of 15 main features tested, 13

features functioned without problems, including login authentication, content upload and download, search functionality, discussion forums, and notification systems. Two additional features, the content recommendation system and usage statistics dashboard, required further adjustments due to minor errors in certain user scenarios.

Functionality Success Rate: 86.7% (13 out of 15 features functioned correctly). This result indicates a satisfactory level of functionality but requires improvement in specific areas before full deployment. This finding is aligned with [Pang et al. \(2020\)](#), who noted that web-based knowledge sharing platforms in higher education typically achieve functionality rates above 80% in initial testing phases, with iterative refinement needed for advanced analytical features.

Reliability test results show that the platform can handle user load to a certain extent without experiencing significant disruption or performance degradation. In load testing, the platform handled up to 200 simultaneous users before performance degradation occurred. In stress testing, the system continued to operate for up to 250 users, although with some response delays in the content upload feature. System Uptime reached 98% during the testing period, indicating high reliability. The failure rate was only 2% of the total test time, indicating good reliability, although improvements are needed to handle maximum capacity limits. These figures demonstrate that the platform is suitable for institutional deployment, as a 98% uptime rate meets standard operational reliability thresholds for educational technology systems.

User Acceptance Test Results

User acceptance testing was carried out through questionnaires administered to 40 participants (30 students and 10 lecturers) after they had used the platform for two weeks. Acceptance scores were calculated based on the aspects of ease of use, access speed, security, and effectiveness of knowledge sharing features. The results are presented in Table 4.

Table 4. User Acceptance Test Results

No	Aspect Evaluated	Score (1–5)	Result
1	Ease of use and user interface	4.4	Very Satisfied
2	Access speed and responsiveness	4.1	Satisfied
3	Data security and privacy	4.3	Very Satisfied
4	Content search and access features	4.5	Very Satisfied
5	Effectiveness for knowledge sharing	4.0	Satisfied
Average		4.2	Satisfied–Very Satisfied

Average Satisfaction Score: 4.2 out of 5, indicating a high level of satisfaction with the platform, especially with aspects of the user interface and content search features which were rated as very helpful in academic activities. Net Promoter Score (NPS): 65, indicating that users are generally satisfied and willing to recommend the platform to their peers, with 75% of users being promoters and only 10% being detractors. As many as 92% of users expressed confidence in the platform's data protection system, which contributed to their willingness to actively share knowledge. The strong security perception aligns with [Nowell et al. \(2025\)](#); [Prasetyo et al. \(2025\)](#), who found that role-based access control significantly increases user trust in academic knowledge sharing platforms. Additionally, 85% of respondents stated that the platform supports collaborative learning and knowledge sharing better than traditional methods, a finding consistent with [Zhang et al. \(2025\)](#), who demonstrated that well-designed web-based platforms reduce barriers to academic knowledge exchange.

Statistical Test Results: Paired Sample T-Test

A paired sample t-test was conducted to determine the significance of the difference between pre-test and post-test scores among 30 student participants who used the web-based knowledge sharing platform. The results are presented in Tables 5 and 6.

Table 5. Paired Samples Statistics

	Measurement	Mean	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	66.13	3.340	0.610
	Post-test	79.60	4.959	0.905

Table 6. Paired Sample T-Test Results

Pair	Mean Difference	Std. Deviation	95% CI Lower	95% CI Upper	t	Sig. (2-tailed)
Pre–Post	-13.467	5.734	-15.608	-11.326	-12.864	.000

As shown in Table 5, the mean pre-test score was 66.13 (SD = 3.340), while the mean post-test score was 79.60 (SD = 4.959), representing an average improvement of 13.47 points. The increase in standard deviation from pre-test to post-test suggests greater variation in post-test performance, which may reflect different levels of engagement with the platform's diverse knowledge-sharing features.

The paired sample t-test results (Table 6) show a significance value (2-tailed) of 0.000, which is below the 0.05 threshold ($p < 0.05$). This confirms a statistically significant difference between pre-test and post-test scores, indicating that the use of the web-based knowledge sharing platform had a meaningful effect on students' knowledge capacity in the Human Computer Interaction course. The gain score was calculated as 0.56, placing it in the medium category ($0.3 \leq g \leq 0.7$). This result aligns with findings by Pangestu et al. (2025), who demonstrated that technology-integrated knowledge sharing approaches consistently produce moderate to significant improvements in learning outcomes when accompanied by structured engagement features such as gamification and collaborative tools.

Comparative Analysis: Knowledge Sharing vs. Web-Based Learning

To further examine the effectiveness of the knowledge sharing approach, a comparative analysis was conducted between the knowledge sharing learning group and a conventional web-based learning group, each consisting of 15 students ($n = 30$ total). The results are presented in Table 7.

Table 7. Comparative Statistics: Knowledge Sharing vs. Web-Based Learning Groups

	Group	N	Mean	Std. Deviation
Pair 1	Knowledge Sharing Learning	15	80.33	4.850
	Web-Based Learning	15	78.87	5.125

As shown in Table 7, the knowledge sharing learning group achieved a higher mean score (80.33) compared to the conventional web-based learning group (78.87), although the difference was relatively small (1.46 points). This finding suggests that while both approaches are effective, the interactive and collaborative features of the knowledge sharing platform provide a marginal

advantage in terms of learning outcomes. The result is consistent with [Hushin \(2025\)](#), who found that interactive data-driven platforms slightly outperform passive web-based content delivery systems in higher education settings. The moderately higher standard deviation in the web-based learning group (5.125 vs. 4.850) may indicate greater variability in learning outcomes in that group, potentially reflecting the absence of structured collaborative engagement features such as discussion forums and gamification.

Discussion

The findings show that the proposed web-based knowledge-sharing model, developed using the ADDIE instructional design framework, is valid, effective, and well accepted by users in the context of Indonesian higher education. Unlike previous studies that primarily focused on isolated aspects of knowledge sharing, such as collaborative learning, repository management, or gamification, the proposed model integrates four complementary dimensions: structured content management, security and access control, user interaction analytics, and gamification-based engagement. This integrated architecture provides a more comprehensive framework for supporting knowledge creation, dissemination, and continuous improvement within higher education institutions.

The proposed model advances previous research by extending the role of knowledge-sharing platforms beyond information exchange to adaptive learning support. Earlier studies have demonstrated the effectiveness of digital knowledge repositories or gamified learning environments independently; however, they rarely combine learning analytics, secure information management, and motivational mechanisms into a unified system ([Widana & Ratnaya, 2021](#)). By incorporating user interaction analytics, the proposed model enables continuous monitoring of learner behavior and evidence-based platform refinement, thereby establishing a feedback-driven knowledge ecosystem rather than a static repository. This contribution broadens the conceptual understanding of web-based knowledge sharing systems as adaptive socio-technical environments that continuously evolve according to user interactions.

The findings are particularly significant within the context of East Nusa Tenggara, where limited digital infrastructure has historically restricted access to educational resources. The high ratings for mobile responsiveness (88%) and data security (92%) indicate that the platform successfully addresses contextual challenges associated with infrastructure constraints. These findings support that technology adoption in developing regions depends not only on technical functionality but also on contextual appropriateness and user trust.

The gamification features, including badges, points, and leaderboards, substantially increased user engagement, with 80% of respondents evaluating the discussion forums and collaborative features positively. These findings reinforce previous evidence reported by [Pangestu et al. \(2025\)](#), while extending existing literature by demonstrating that gamification becomes more effective when integrated with knowledge analytics and structured content organization. Rather than functioning solely as motivational tools, gamification elements in the proposed model contribute to sustained knowledge exchange and collaborative learning behaviors. Furthermore, the incorporation of user interaction analytics enables administrators to identify participation patterns, optimize learning resources, and improve platform functionality based on empirical usage data, consistent with the adaptive learning approach advocated.

From a theoretical perspective, this study contributes to the literature by proposing an integrated conceptual model that combines instructional design principles, knowledge management, learning analytics, and gamification within a single web-based framework. The findings suggest that knowledge-sharing effectiveness depends not only on technological accessibility but also on

interactions among system quality, user engagement, data-driven adaptation, and institutional knowledge management practices. Consequently, the study extends existing knowledge-sharing theory by positioning analytics-supported feedback and motivational mechanisms as complementary constructs that strengthen collaborative knowledge ecosystems in higher education.

From a practical perspective, the proposed model offers higher education institutions a scalable framework to improve knowledge management practices and promote collaborative learning. Universities can utilize the integrated platform to organize institutional knowledge systematically, monitor user participation, encourage sustained engagement through gamification, and support evidence-based academic decision-making using learning analytics. These practical implications are particularly relevant for institutions in developing regions seeking cost-effective digital transformation strategies while maintaining secure and accessible learning environments.

Despite these contributions, several limitations remain. The functionality success rate of 86.7% indicates that the recommendation engine and usage statistics modules require further optimization. In addition, the current platform supports approximately 200 simultaneous users before noticeable performance degradation occurs, suggesting the need for infrastructure scaling and algorithm optimization for wider institutional implementation.

The medium normalized gain score ($N\text{-gain} = 0.56$) indicates that the platform produced a meaningful improvement in students' knowledge capacity while highlighting opportunities for further enhancement. Future research should investigate the long-term effects of analytics-driven personalization, artificial intelligence-based recommendation algorithms, and extended implementation periods on learning outcomes. Longitudinal and multi-institutional studies would also strengthen the model's generalizability and provide deeper insights into how adaptive knowledge-sharing ecosystems contribute to sustainable academic performance and professional knowledge development across diverse higher education contexts.

Conclusion

This study developed and validated a web-based knowledge-sharing model designed to enhance the knowledge capacity of students and lecturers in higher education. The findings demonstrate that the proposed model effectively supports knowledge sharing by integrating content management, collaborative discussion, project-based interaction, gamification, user analytics, and secure access within a single platform. The model offers a practical solution to knowledge-sharing challenges in higher education by creating a more collaborative, accessible, and technology-supported learning environment. The integration of intelligent platform features and a systematic development process is the main contribution of this study to educational technology and web-based knowledge sharing. These findings suggest that the proposed model can serve as a practical reference for higher education institutions seeking to strengthen collaborative learning and knowledge management through digital technologies. Nevertheless, the study was conducted within a single institutional context, indicating the need for further research to evaluate the model across different educational settings, disciplines, and implementation periods, while exploring more advanced intelligent features to further improve knowledge sharing and learning outcomes.

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