



Development of a Conceptual Framework for Artificial Intelligence in User Experience-Based Digital Learning Systems at Indonesian Universities

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ABSTRACT

This study aims to develop a conceptual framework for artificial intelligence in user experience-based digital learning systems at Indonesian universities. The study responds to the growing use of AI in higher education, where students and lecturers increasingly rely on AI tools for learning support, academic writing, content exploration, and digital interaction, while institutional policies and user-centered system design remain limited. This research used a qualitative approach with an exploratory case study design. Data were collected through semi-structured interviews, limited observation, and documentation involving students, lecturers, LMS administrators, information technology staff, and academic policymakers selected through purposive sampling. The findings reveal six main themes: AI as a tool for personalized and self-directed learning, UX as a determinant of AI acceptance, trust and transparency in AI-supported learning, AI literacy as a core academic requirement, institutional readiness and digital governance, and the need for a UX-based AI conceptual framework. These findings show that meaningful AI integration requires more than technical adoption. It requires usable systems, ethical guidance, human control, institutional support, and critical AI literacy. This study contributes to human-centered AI and digital learning literature by offering a conceptual understanding of AI integration based on user experience in Indonesian higher education. The study recommends that universities develop responsible AI policies, integrate AI features into LMS platforms, and provide AI literacy training for lecturers and students. Further research may test the framework across different institutional contexts.



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1. Introduction

The introduction serves as a crucial opening for the research paper. It should capture the reader's attention and provide essential context for understanding the content of the research. The author(s) must clearly address the research problem, offer relevant background information, and establish their work within the existing body of research. Additionally, the introduction should justify the study's significance and outline the paper's structure and contributions.

The digital transformation of higher education has changed how students access learning materials, interact with lecturers, manage assignments, and construct learning experiences. At the

global level, artificial intelligence, or AI, has increasingly supported adaptive learning, automated feedback, learning analytics, recommendation systems, and digital academic services. Chen et al. (2020) explain that AI in education has moved beyond administrative functions and now supports instructional processes and student learning. Wang et al. (2024) show that research on AI in education has expanded into learning personalization, performance prediction, intelligent assessment, and adaptive learning environment design. This development makes user experience, or UX, a central issue because the success of digital learning systems depends not only on technological sophistication but also on usability, trust, engagement, comfort, and perceived benefits among users.

In higher education, AI has started to become part of the digital learning ecosystem that supports more independent and personalized learning. Ouyang and Jiao (2021) explain that AI in education develops through three paradigms, namely AI-directed learning, AI-supported learning, and AI-empowered learning. This shift requires digital learning systems that do not only provide automated features but also strengthen students' active role in making learning decisions. Al-Fraihat et al. (2020) emphasize that the success of e-learning systems depends on system quality, information quality, service quality, user satisfaction, and perceived benefits. Maslov et al. (2021) also found that UX in learning management systems is formed through interactions among interface design, navigation structure, feature usability, and users' academic experience. Therefore, the development of AI in digital learning needs to integrate technological, pedagogical, and human experience dimensions.

In Indonesia, the digitalization of higher education increased during the period of emergency remote learning and continued in the post-pandemic phase. Rahiem (2020) found that Indonesian university students' online learning experiences involved not only access flexibility but also connection problems, emotional pressure, limited interaction, and the need for clearer pedagogical support. Almaiah et al. (2020) argue that the success of e-learning strongly depends on technological readiness, organizational support, and users' ability to adapt to digital systems. Wicaksana et al. (2024) show that UX evaluation in Indonesian higher education LMS needs to consider attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. These findings indicate that digital learning problems in Indonesia cannot be understood only through platform availability. They must also be examined through the real experiences of students, lecturers, and system administrators.

The integration of AI into digital learning systems in Indonesian universities still faces complex field-level problems. Students have started to use AI to search for references, develop ideas, translate texts, check grammar, summarize materials, and understand course content. However, these practices often occur without clear ethical guidelines, academic use standards, or learning experience design. Darmono et al. (2025) found that Indonesian higher education students' intention to adopt AI for self-directed learning is influenced by attitude, subjective norms, perceived behavioral control, perceived usefulness, facilitating conditions, optimism, and perception of AI. Hamid et al. (2025) show that lecturers and students in Indonesian higher education view AI as a tool that supports learning efficiency and personalization, but they also face problems related to access, cost, dependency, and digital literacy readiness. This condition confirms that the development of an AI conceptual framework based on UX must start from user experience rather than technical assumptions made by system developers.

This issue is important because AI in digital learning systems affects social dimensions, academic culture, and the quality of higher education. AI can expand access to learning, but it can also widen inequalities when infrastructure, digital literacy, and institutional support remain uneven. Kasneci et al. (2023) explain that large language models create opportunities for personalized learning, but they also raise risks related to information accuracy, dependency, and academic integrity. Cotton et al. (2024) emphasize that the use of ChatGPT in higher education must be followed by academic strategies that maintain honesty, transparency, and more authentic assessment design. Ravšelj et al. (2025) show that students in different countries use ChatGPT

for brainstorming, summarizing texts, and searching for articles, but they also acknowledge the need for institutional-level AI regulation. These findings show that AI should not be understood merely as a supporting tool. It must be examined as part of a broader transformation in academic culture.

Theoretically, this study is grounded in human-centered artificial intelligence, AI literacy, and learner-centered digital learning. Shneiderman (2020) argues that human-centered AI must maintain a balance between human control and computer automation so that systems remain reliable, safe, and trustworthy. Ng et al. (2021) explain that AI literacy includes the ability to understand, use, evaluate, and consider the ethical issues of AI technology. Laupichler et al. (2022) show that AI literacy in higher education remains a developing research area, especially in relation to conceptual understanding, critical evaluation, and adult user readiness. Markauskaite et al. (2022) add that students need new capabilities to learn, think, collaborate, and make decisions in educational environments increasingly connected to AI. This theoretical foundation is relevant because AI in digital learning must be designed to strengthen learning experiences rather than replace students' thinking processes.

Although research on AI in education continues to grow, there is still a limitation in studies that specifically develop an AI conceptual framework based on UX in the context of Indonesian higher education. Chen et al. (2020) show that there remains a gap between the growth of AI applications and the strengthening of educational theories that support them. Kuleto et al. (2021) explain that higher education institutions face challenges in integrating AI due to resource readiness, user skills, and institutional strategy. Pisica et al. (2023) found that academics perceive AI as beneficial for learning and efficiency, but they also identify ethical, data security, and psychosocial concerns. Ouyang and Zhang (2024) emphasize that AI applications in learning analytics still require designs that are sensitive to pedagogical goals and collaborative contexts. Based on this gap, this study aims to develop a conceptual framework for AI in UX-based digital learning systems at Indonesian universities. This study is expected to provide a theoretical contribution to human-centered AI studies and a practical contribution to universities in designing digital learning systems that are adaptive, ethical, inclusive, and centered on user experience.

2. Materials and Methods

This study uses a qualitative approach with an exploratory case study design. This approach was selected because the study aims to develop a conceptual framework for AI in UX-based digital learning systems at Indonesian universities. Lim (2025) explains that qualitative research is relevant for understanding complex social phenomena through meaning, context, and human experience. A case study design was used because the integration of AI, UX, and digital learning needs to be understood through institutional context, user experience, interaction processes, and implementation dynamics in higher education settings. Yadav (2022) emphasizes that good qualitative research needs to show alignment among research focus, context, data, and interpretation process. Therefore, an exploratory case study design is appropriate for examining how AI is understood, used, and interpreted by users within digital learning systems.

This study was conducted at several universities in Indonesia that have used learning management systems, digital learning platforms, and AI-based applications in academic activities. The research period was designed for one academic semester, covering instrument preparation, data collection, data validation, data analysis, and conceptual framework development. The research sites were selected by considering the availability of LMS, the use of online conferencing applications, digital assessment systems, and the experience of lecturers and students in using generative AI for academic purposes. Kuleto et al. (2021) explain that universities need technological readiness, human resource capacity, and institutional strategies to integrate AI. Shneiderman (2020) stresses that AI systems must be designed with the principle of human control so that technology supports users' needs. Based on these considerations, the

research sites were selected because they provide relevant contexts for understanding the relationship among digital systems, AI, and user experience.

The research subjects consisted of students, lecturers, LMS administrators, information technology staff, and academic policymakers at the study program or faculty level. Informants were selected using purposive sampling because this study required participants who had direct experience with digital learning systems and AI use in academic activities. Ahmad and Wilkins (2025) explain that purposive sampling is suitable when researchers need information-rich informants who are directly involved in the phenomenon being studied. Student informant criteria included experience in using LMS, experience in using AI to support learning, and the ability to explain usage experiences reflectively. Lecturer informant criteria included experience in managing digital classes, using LMS, or integrating AI into teaching. LMS administrators and information technology staff were selected based on their involvement in platform management, technical support, and campus digital service development. If needed, snowball sampling was used to identify additional informants with specific experiences, such as lecturers who had used AI for formative feedback or students who actively used AI for self-directed learning.

Data were collected through semi-structured interviews, limited observation, and documentation. Semi-structured interviews were used so that the researcher could follow a consistent interview guide while still exploring further answers based on the informants' experiences. Junnier (2024) shows that semi-structured interviews can help researchers understand participants' experiences, attitudes, and reasoning in a more open way. The interview questions covered experiences in using LMS, perceptions of AI in learning, system usability, technical barriers, trust in AI outputs, campus support, and expectations for UX-based AI system design. Limited observation was conducted on system-use activities, such as accessing materials, submitting assignments, interacting through LMS, using digital features, and using AI to understand course content. Documentation was carried out by reviewing LMS guidelines, digital learning policies, training modules, academic documents, and screenshots of system features. These combined data sources were used to obtain a more comprehensive understanding of user experience.

Data validation was conducted through source triangulation, method triangulation, member checking, and audit trail. Source triangulation was conducted by comparing information from students, lecturers, LMS administrators, information technology staff, and academic leaders. Schlunegger et al. (2024) explain that triangulation in case studies can strengthen data quality because researchers do not rely on a single source of information. Method triangulation was conducted by comparing interview results, observation notes, and institutional documents. McKim (2023) emphasizes that structured member checking can help researchers ensure that data interpretation remains consistent with participants' experiences. In this study, member checking was conducted by sending interview summaries or initial interpretations to selected informants. Ahmed (2024) explains that credibility, transferability, dependability, and confirmability are important pillars in maintaining trustworthiness in qualitative data. Therefore, an audit trail was maintained by storing research process notes, coding decisions, analytic memos, category revisions, and the rationale behind theme development.

Data analysis used reflective thematic analysis. The analysis process began with interview transcription, repeated reading, identification of meaning units, initial coding, grouping codes into categories, developing themes, reviewing themes, and writing the findings narrative. Ahmed et al. (2025) explain that thematic analysis helps researchers identify patterns of meaning in qualitative data systematically. Initial coding focused on user experience, UX needs, perceptions of AI, AI literacy readiness, institutional support, ethical risks, user control, and digital learning design principles. Braun and Clarke (2023) emphasize that thematic analysis needs to be conducted reflectively so that themes do not merely summarize data but represent context-aware interpretation. After initial coding, the researcher grouped categories to examine relationships among usability, trust in AI, lecturer support, institutional readiness, and students' learning

experience. The final themes were then used as the basis for developing a conceptual framework for AI in UX-based digital learning systems.

The final stage of the study involved developing a conceptual framework based on the integration of field findings and theoretical literature. The framework was developed through mapping key themes, identifying relationships among components, and formulating design principles that can be applied by universities. Markauskaite et al. (2022) emphasize that learning in the AI era requires capabilities that connect technology, cognition, social interaction, and values. Laupichler et al. (2022) show that AI literacy is important because users need to understand how AI works, its benefits, risks, and limitations. Ng et al. (2021) position understanding, use, evaluation, and ethics as important elements of AI literacy. Based on these principles, the components analyzed in this study include user readiness, digital system quality, AI literacy, academic ethics, institutional support, human control, learning personalization, and student learning experience. The findings are not intended for statistical generalization, but for limited replication through transparent descriptions of context, informant criteria, data collection techniques, validation procedures, and analysis stages.

3. Results and Discussions

The findings show that the integration of artificial intelligence in UX-based digital learning systems at Indonesian universities is understood as a promising but still uneven process. The data from interviews, limited observation, and institutional documentation indicate that AI is not yet fully embedded as a formal part of digital learning design. Instead, students and lecturers often use AI independently to support academic tasks, such as searching for ideas, summarizing materials, translating texts, checking grammar, and preparing learning content. This pattern shows that AI adoption in higher education has grown faster at the user level than at the institutional policy level. One student stated, “I use AI when I do not understand the reading material, but I still need to check it again because sometimes the answer is too general” (Student 3). This statement reflects a common pattern in which AI is perceived as useful, but not fully trusted without human verification.

The first major theme is AI as a supporting tool for personalized and self-directed learning. Students viewed AI as helpful because it allowed them to learn at their own pace, especially when they faced difficulty understanding English sources, technical concepts, or complex lecture materials. Some students used AI to simplify explanations, generate outlines, and compare different interpretations of a topic. One participant explained, “AI helps me understand difficult concepts before I ask the lecturer, so I feel more prepared in class” (Student 7). Lecturers also acknowledged that AI could support students’ learning autonomy, but they stressed that students still needed critical thinking skills to evaluate AI-generated content. This finding suggests that AI can strengthen self-directed learning when students use it as a learning companion rather than as a shortcut for completing assignments.

The second theme is user experience as a determinant of AI acceptance in digital learning systems. Participants emphasized that AI-based learning tools would only be accepted if they were easy to access, simple to understand, and connected to existing learning platforms. Observations of LMS use showed that students preferred systems with clear menus, fast access, mobile-friendly interfaces, and direct links to learning materials. Several students reported that they avoided digital features that required too many steps. One student said, “If the system is complicated, I prefer to use another tool outside the campus LMS” (Student 2). This finding shows that UX is not a cosmetic element of digital learning systems. It shapes whether users continue to use institutional platforms or shift to external AI tools that feel more practical.

The third theme is trust, transparency, and human control in AI-supported learning. Students and lecturers expressed concern about the accuracy of AI outputs. They also questioned how AI generates answers, whether the sources are reliable, and how far AI may be used in academic

assignments. A lecturer stated, “AI is useful, but students must know that not every answer from AI is academically valid” (Lecturer 4). This concern was also found in documentation analysis, where institutional guidelines on AI use were still limited or not yet fully standardized. The finding indicates that trust in AI depends on transparency, guidance, and clear academic boundaries. Users need to understand when AI can support learning and when it can threaten academic integrity.

The fourth theme is AI literacy as a core requirement for meaningful digital learning. Interviews revealed that students had different levels of understanding about AI. Some students used AI critically by checking sources and revising outputs. Others copied AI-generated answers without adequate evaluation. Lecturers also reported that many students were able to use AI tools technically, but they lacked ethical and academic judgment. One lecturer noted, “Students are fast in using AI, but not all of them understand how to use it responsibly” (Lecturer 1). This finding suggests that AI literacy in higher education should include technical, cognitive, and ethical dimensions. Students need to know how AI works, how to evaluate AI-generated information, and how to use AI without violating academic norms.

The fifth theme is institutional readiness and the need for digital governance. Data from interviews with LMS administrators and IT staff showed that universities face challenges related to infrastructure, integration, training, data security, and policy development. Some campuses already use LMS and digital assessment systems, but AI features are still mostly external and not integrated into institutional platforms. An IT staff member stated, “The problem is not only the tool. We also need policy, server readiness, user training, and data protection” (IT Staff 2). This finding shows that AI integration requires more than individual adoption. It requires institutional governance that connects technological readiness, academic policy, ethical standards, and user support.

The sixth theme is the need for a UX-based conceptual framework for AI in digital learning systems. The findings indicate that AI-based learning systems should not be designed only from a technical perspective. They should be developed through a human-centered approach that considers user readiness, usability, trust, ethics, personalization, institutional support, and learning outcomes. Participants expected AI systems that could help students understand materials, provide feedback, recommend learning resources, and support lecturers in monitoring learning progress. However, they also expected systems that maintain human control and academic responsibility. A policymaker stated, “AI should support the learning process, but the final academic decision must remain with lecturers and students” (Academic Leader 1). This finding confirms the importance of a conceptual framework that positions AI as a support system, not as a replacement for human judgment.

Based on these themes, the study identifies several core components for developing an AI conceptual framework in UX-based digital learning systems. These components include user readiness, system usability, AI literacy, academic ethics, human control, institutional support, learning personalization, data protection, and learning experience quality. The relationship among these components shows that AI can improve digital learning only when users understand its function, institutions provide clear governance, and systems are designed around actual user needs. The findings also show that UX functions as a bridge between AI technology and meaningful learning experience. Without good UX, AI features may remain unused, misunderstood, or replaced by external tools outside institutional control.

Discussion

The findings confirm that AI adoption in Indonesian higher education is shaped by the interaction between user needs, system design, institutional readiness, and academic culture. This study supports Chen et al. (2020), who argue that AI in education has expanded from administrative automation to direct support for learning and instruction. However, the findings also show that this expansion has not yet been fully matched by institutional policy and UX-based

design in Indonesian universities. Students already use AI in everyday academic practices, but universities still need clearer frameworks to guide ethical, pedagogical, and technical integration. This condition shows a gap between user-level adoption and institution-level governance.

The finding that students use AI for self-directed learning aligns with Ouyang and Jiao's (2021) view that AI can support learner agency when it is used to empower students rather than control the learning process. In this study, students used AI to clarify concepts, summarize materials, and prepare for class discussions. This pattern shows that AI can strengthen student autonomy when it encourages preparation, reflection, and independent inquiry. At the same time, the findings show that AI may weaken learning when students use it only to produce ready-made answers. This confirms the need to design AI-supported learning around critical engagement, not only output efficiency.

The role of UX in AI acceptance is also consistent with Al-Fraihat et al. (2020), who emphasize that system quality, information quality, service quality, and user satisfaction influence e-learning success. The present study extends this argument by showing that UX becomes more critical when AI is integrated into digital learning systems. Students did not only evaluate whether the system worked. They also evaluated whether the system was easy, fast, understandable, and relevant to their academic tasks. Maslov et al. (2021) similarly show that LMS user experience depends on interface quality, navigation, and interaction design. This study adds that AI features must be embedded into the learning platform in a way that feels natural to users, not as an additional tool that increases complexity.

The finding on trust and transparency supports Shneiderman's (2020) argument that human-centered AI must remain reliable, safe, and trustworthy. Participants in this study did not reject AI. They accepted AI with caution. Their concern focused on accuracy, academic validity, source reliability, and the boundary between assistance and misconduct. Kasneci et al. (2023) also highlight that large language models create opportunities for education, but they raise risks related to misinformation and academic integrity. This study reinforces that trust in AI does not emerge only from technical performance. It also depends on academic guidance, transparent use, and the ability of users to verify AI-generated content.

The study also confirms the importance of AI literacy as a condition for responsible AI use. Ng et al. (2021) define AI literacy as the ability to understand, use, evaluate, and respond ethically to AI. The findings show that students may be technically fluent in using AI tools but still lack the critical and ethical capacity to evaluate outputs. Laupichler et al. (2022) argue that AI literacy in higher and adult education remains an important field because users need conceptual understanding and critical judgment. This study adds contextual evidence from Indonesian higher education, where AI literacy must address not only technical knowledge but also academic writing norms, citation ethics, data privacy, and responsible learning behavior.

Institutional readiness emerged as another important finding. This result is in line with Kuleto et al. (2021), who state that higher education institutions face challenges related to resources, strategy, and human capacity when integrating AI. In this study, institutional readiness included LMS infrastructure, digital policy, lecturer training, student guidance, and data protection. Almaiah et al. (2020) show that successful e-learning implementation depends on technological, organizational, and user-related factors. The present study strengthens this argument by showing that AI integration requires coordinated governance. AI adoption cannot rely only on student initiative or lecturer experimentation. It needs institutional direction that connects technology, pedagogy, ethics, and support services.

The findings also offer a new perspective on the relationship between AI and academic culture. Cotton et al. (2024) stress that the use of ChatGPT in higher education requires strategies to protect academic integrity. The present study shows that academic integrity should not only be addressed through prohibition. It should be addressed through clear guidance, authentic assessment, transparent AI-use policies, and reflective learning tasks. Ravšelj et al. (2025) found

that students across countries use ChatGPT for brainstorming and summarizing, while also recognizing the need for institutional regulation. This study confirms that Indonesian universities need AI policies that are not merely restrictive. They need policies that help students understand appropriate, ethical, and productive AI use.

The conceptual implication of this study lies in the proposed integration of human-centered AI, AI literacy, and UX-based digital learning. Markauskaite et al. (2022) argue that learners in an AI-rich world need new capabilities that connect technology, cognition, social interaction, and values. The present findings support this view by showing that meaningful AI integration requires students to combine technical use, critical thinking, ethical judgment, and learning responsibility. Wicaksana et al. (2024) show that LMS evaluation in Indonesian higher education needs to consider attractiveness, clarity, efficiency, dependability, stimulation, and novelty. This study extends that idea by showing that UX indicators should be connected to AI-specific concerns, such as trust, explainability, human control, and academic accountability.

Practically, the findings suggest that universities should develop AI-based digital learning systems through a staged and user-centered process. First, universities need to map user needs through student, lecturer, and administrator feedback. Second, institutions need to develop AI-use guidelines that explain acceptable use, prohibited use, citation expectations, privacy issues, and lecturer authority in assessment. Third, AI literacy training should be provided for students and lecturers. Fourth, AI features should be integrated into existing LMS platforms with simple navigation and clear learning functions. Fifth, universities need evaluation mechanisms to assess whether AI improves learning quality, not only system efficiency. These practical steps can help institutions avoid fragmented AI adoption and move toward more accountable digital learning governance.

This study also has implications for future research. Further studies can test the proposed conceptual framework through broader qualitative comparison across different types of universities, such as public universities, private universities, religious universities, and vocational higher education institutions. Future research can also use mixed methods to examine the relationship between UX quality, AI literacy, trust in AI, and learning engagement. In addition, longitudinal studies are needed to understand how students' AI use changes across semesters and how institutional policies influence academic behavior. These directions can deepen the understanding of AI in higher education and support the development of digital learning systems that are adaptive, ethical, and centered on user experience.

4. Conclusions

This study concludes that the integration of artificial intelligence in UX-based digital learning systems at Indonesian universities is shaped by the interaction between user readiness, system usability, AI literacy, institutional support, academic ethics, and human control. The findings show that students and lecturers already use AI to support learning activities, such as understanding materials, developing ideas, summarizing texts, translating sources, and improving academic writing. However, AI adoption still occurs more strongly at the individual level than at the institutional level. This condition shows the need for a conceptual framework that positions AI not only as a technological tool, but also as part of a human-centered learning ecosystem that supports autonomy, trust, responsibility, and meaningful academic experience.

Theoretically, this study contributes to the development of human-centered AI, AI literacy, and UX-based digital learning studies by showing that AI integration in higher education must be understood through user experience, ethical awareness, and institutional context. Practically, the findings suggest that universities need to design AI-based learning systems that are easy to use, transparent, integrated into existing LMS platforms, and supported by clear academic guidelines. From a policy perspective, universities need formal regulations on responsible AI use, data protection, academic integrity, and AI literacy training for students and lecturers. Future research

can expand this study by comparing different types of higher education institutions, applying mixed-method designs, or testing the proposed conceptual framework in broader learning environments.

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