Available online at
https://journalined.uitm.edu.my/

e-ISSN: 3030-6663

International Journal on e-Learning and Higher Education 21 (2) 2026, 94-112

Adopting AI Chatbots in Studio-Based Learning: Exploring the Interplay of Technology Readiness and Academic Burnout

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ARTICLE INFO

Article history:
Received 23 October 2025
Revised 15 June 2026
Accepted 21 June 2026
Online first
Published 30 June 2026

Keywords:
Artificial Intelligence
Academic Burnout
Chatbots
Design Education
Studio-Based Learning

DOI:
10.24191/ijelhe.v21n2.21210

ABSTRACT

In project-intensive, studio-based courses (e.g., Architecture, Interior Design), rigorous pedagogical demands often induce high student stress and workload. This conceptual paper proposes a theoretical framework linking student technology readiness and academic burnout to the adoption of AI chatbots in design education. Drawing on Parasuraman's Technology Readiness Index (TRI) and the Technology Acceptance Model (TAM), the framework posits that drivers (optimism, innovativeness) enhance trust and perceived usefulness, thereby facilitating chatbot adoption, while inhibitors (discomfort, insecurity) obstruct it. Concurrently, academic burnout (characterized by exhaustion, cynicism, and reduced efficacy) is theorized to exert a dual influence on technology uptake: severe burnout hinders engagement with new tools due to cognitive fatigue, whereas moderate burnout motivates students to seek AI chatbot assistance as a functional coping strategy to manage heavy workloads. By emphasizing the unique dynamics of creative design studios, this model highlights how these personal and environmental interactions are amplified. As a conceptual study, this paper provides explicit propositions to guide future empirical validation alongside practical pedagogical strategies such as structured AI training and support resources aimed at strategically integrating AI tools while protecting the students' well-being.

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1. INTRODUCTION

The rapid advancement of generative artificial intelligence (GenAI) has transformed the landscape of higher education, introducing new opportunities for personalized learning, knowledge construction, and academic support. Recent developments in large language models (LLMs), such as ChatGPT, Gemini, Claude, and domain-specific educational chatbots, have enabled students to engage with adaptive systems capable of generating explanations, facilitating ideation, and supporting complex problem-solving processes (Chan & Lee, 2023; Karimova et al., 2024; McGrath et al., 2024). Unlike earlier educational technologies that primarily served as repositories of information, contemporary GenAI systems function as interactive learning partners capable of responding dynamically to individual learner needs. Within higher education, scholars have reported numerous benefits associated with GenAI adoption, including improved learning efficiency, enhanced creativity, personalized feedback, and increased student engagement (Hashem et al., 2023; Kanont et al., 2024). These affordances are particularly valuable in disciplines characterized by intensive project-based learning, where students frequently encounter challenges related to idea generation, information synthesis, and iterative development. Recent investigations further suggest that AI-powered conversational agents can reduce cognitive barriers during complex learning tasks by providing immediate guidance and contextualized feedback (Song et al., 2025; Abrusci et al., 2025). Despite these advantages, the integration of GenAI into educational settings remains accompanied by significant pedagogical concerns. Researchers have highlighted potential risks related to overreliance on AI-generated content, diminished critical thinking skills, academic integrity violations, and reduced opportunities for reflective learning (Ahmed et al., 2024; Batista et al., 2024; Jiang, 2025). Consequently, the educational value of GenAI cannot be evaluated solely through its technological capabilities but must also be examined through the psychological and behavioral characteristics of learners. Among the factors frequently associated with variations in AI adoption, technology readiness has emerged as a particularly influential determinant.

1.1 Technological Readiness and AI Adoption

Technology readiness refers to an individual's propensity to embrace and utilize new technologies to accomplish personal or professional goals. Originally conceptualized through dimensions of optimism, innovativeness, discomfort, and insecurity, technology readiness provides a useful framework for understanding differences in technology acceptance behaviors among learners. Individuals with high level of optimism and innovativeness tend to perceive emerging technologies as beneficial and empowering, whereas those experiencing discomfort or insecurity often exhibit resistance toward technological change. Within educational contexts, technology readiness has consistently been identified as a significant predictor of technology acceptance, perceived usefulness, and behavioral intention to use digital learning systems (Hashem et al., 2023; Labadze et al., 2023). As GenAI tools become increasingly integrated into academic environments, students with higher technology readiness are generally more willing to experiment with AI applications, explore advanced functionalities, and incorporate AI-generated insights into their learning processes. Conversely, students demonstrating lower levels of readiness may perceive AI systems as intimidating, unreliable, or difficult to integrate into existing study routines. Recent studies further suggest that technology readiness influences not only technology adoption but also the learners' capacity to derive meaningful educational benefits from AI-supported environments. Students possessing stronger technological confidence often report greater satisfaction, higher perceived utility, and more productive interactions with conversational AI systems (Chan & Lee, 2023; Tian et al., 2024). Nevertheless, technology readiness alone may not fully explain AI adoption behaviors, particularly within learning environments characterized by substantial psychological demands and sustained academic pressure. Under such conditions, factors associated with the students' well-being become equally important in understanding technology usage patterns.

1.2 Academic Burnout in Higher Education

Academic burnout has emerged as one of the most significant psychological challenges confronting university students. Derived from occupational burnout theory, academic burnout is commonly characterized by emotional exhaustion, cynicism toward academic activities, and diminished perceptions of personal accomplishment (Li & Li, 2024; Wei, 2023). Students experiencing burnout frequently report reduced motivation, impaired concentration, lower academic performance, and increased psychological distress.

The prevalence of academic burnout has become increasingly evident within contemporary higher education, particularly in programs requiring sustained cognitive engagement and intensive project work. Factors such as excessive workload, time pressure, performance expectations, and prolonged exposure to academic stressors contribute significantly to burnout development (Dong et al., 2025; Ybarra, 2024). Among creative disciplines, including architecture, interior architecture, and design education, these pressures are often intensified by iterative design processes, continuous assessment cycles, and the expectation of producing innovative solutions under strict deadlines.

The studio environment, while pedagogically valuable, can therefore become a source of substantial emotional and cognitive strain. Students frequently navigate cycles of ideation, critique, revision, and presentation, requiring sustained engagement over extended periods. Consequently, understanding how burning out influences students' interaction with emerging technologies has become increasingly important, particularly as AI-based tools are progressively introduced into design education.

1.3 Academic Burnout and Generative AI Adoption

The relationship between academic burnout and GenAI adoption remains theoretically complex. On one hand, burnout may inhibit technology adoption by reducing learners' motivation, cognitive capacity, and willingness to engage with unfamiliar systems. Students experiencing emotional exhaustion may perceive the additional effort required to learn new technologies as burdensome, thereby reducing their likelihood of experimenting with AI-supported learning tools (Nizam & Matori, 2025).On the other hand, burnout may simultaneously function as a catalyst for AI adoption. Students facing overwhelming workloads often seek mechanisms that enhance efficiency and reduce cognitive demands. In such circumstances, GenAI systems may serve as compensatory resources that help students manage academic pressures by providing immediate assistance with brainstorming, information synthesis, drafting, and problem solving (Jo, 2024; Guo, 2025). Adaptive chatbots can therefore operate as cognitive support systems that alleviate some of the mental burden associated with project-intensive academic tasks. However, scholars caution that excessive dependence on AI may generate unintended consequences. Emerging concepts such as cognitive offloading, algorithmic dependency, and digital fatigue suggest that prolonged reliance on AI-generated solutions may reduce critical engagement and independent problem-solving capabilities (Azhar, 2026; Yan et al., 2025). Similarly, concerns have been raised regarding "algorithmic intimacy," whereby students develop psychological dependence on conversational agents as sources of reassurance and decision support (Kim et al., 2024). These contradictory findings indicate that academic burnout may simultaneously encourage and constrain AI adoption, highlighting the need for a more nuanced examination of the factors that shape this relationship.

1.4 Generative A.I in Studio-Based Learning

Studio-based learning represents a distinctive pedagogical model characterized by experiential learning, iterative development, reflective practice, and collaborative critique. Unlike traditional lecture-based instruction, studio education emphasizes process-oriented learning in which students construct knowledge through repeated cycles of experimentation, evaluation, and refinement. Such environments are particularly prevalent in architecture, interior architecture, and design programs. The emergence of GenAI technologies has introduced new possibilities for supporting studio pedagogy. AI-powered systems can facilitate concept generation, design exploration, visual development, and reflective inquiry, functioning as collaborative partners throughout the design process (Rodriguez et al., 2026a; Rodriguez et al., 2026b). By providing rapid feedback and alternative perspectives, AI tools may enhance creative exploration while reducing the cognitive demands associated with repetitive design tasks.

Nevertheless, concerns persist regarding the pedagogical implications of integrating AI into creative disciplines. Researchers have identified risks including stylistic homogenization, diminished originality, weakened reflective practice, and increased dependency on algorithmically generated outputs (Khemakhem, 2025a; Khemakhem, 2025b). Uncritical adoption may shift student attention from process-oriented learning toward outcome-oriented production, thereby undermining the metacognitive development central to studio education. Consequently, contemporary scholarship advocates a transition from passive AI utilization toward a human-centered "learning-by-co-doing" paradigm. This approach positions AI as a collaborative thinking partner rather than a replacement for human creativity, emphasizing reflective engagement, ethical awareness, and critical evaluation throughout the design process (Iranmanesh, 2026). Such a framework aligns with broader calls for AI literacy initiatives that cultivate responsible, reflective, and pedagogically meaningful interactions with emerging technologies.

1.5 Research Gap and Conceptual Foundation

Although substantial literature exists on generative AI adoption, technology readiness, and academic burnout, these domains have largely evolved as independent streams of inquiry. Existing studies primarily investigate technological determinants of AI acceptance or psychological outcomes associated with academic stress, with limited attention given to their combined influence within studio-based learning environments. Furthermore, the unique characteristics of design education, including intensive workloads, iterative critique processes, and reflective practice requirements, may significantly alter how students perceive and utilize AI technologies. Consequently, there remains insufficient empirical evidence explaining how technology readiness and academic burnout jointly shape students' adoption of AI chatbots within design studio contexts. Specifically, it remains unclear whether technology readiness strengthens AI utilization under conditions of burnout or whether academic burnout moderates the relationship between technological predisposition and AI adoption behavior. Addressing this gap is essential for developing pedagogical frameworks that leverage the benefits of GenAI while safeguarding student well-being, creative autonomy, and reflective learning practices. Therefore, the present study proposes an integrated framework that examines the interplay between technology readiness, academic burnout, and AI chatbot adoption within studio-based learning environments.

2. THEORETICAL FOUNDATION

2.1 Technology Readiness Theory

Technology Readiness Theory (TRT), originally developed by Parasuraman (2000), provides a robust framework for understanding an individual's propensity to embrace and utilize new technologies in achieving personal and professional objectives. Unlike traditional technology acceptance theories that focus primarily on perceptions formed after exposure to a technological system, TRT emphasizes an individual's pre-existing psychological disposition toward technology. Consequently, the theory is particularly relevant for examining emerging technologies such as generative artificial intelligence (GenAI), where user attitudes and behavioral intentions are often shaped before extensive interaction with the technology occurs.

Technology readiness consists of four dimensions: optimism, innovativeness, discomfort, and insecurity. Optimism refers to a positive view of technology and the belief that technological advancements enhance efficiency, flexibility, and control. Innovativeness reflects a tendency to be among the first to experiment with and adopt emerging technologies. In contrast, discomfort represents perceptions of being overwhelmed by technology, while insecurity relates to concerns regarding reliability, trustworthiness, and potential negative consequences associated with technology usage. Within educational settings, technology readiness has been consistently identified as a significant predictor of students' willingness to adopt digital learning platforms, virtual learning environments, mobile applications, and intelligent educational systems. Students possessing high levels of optimism and innovativeness generally demonstrate stronger intentions to explore new technological tools and exhibit greater confidence when integrating technology into their learning activities. Conversely, students experiencing discomfort or insecurity often display reluctance toward technological experimentation and may perceive technological innovations as sources of additional complexity rather than support.

The relevance of TRT becomes increasingly pronounced in the context of AI chatbot adoption. Unlike conventional educational technologies that primarily facilitate information access, AI chatbots actively participate in learning interactions by generating content, offering feedback, and assisting with problem-solving activities. Such capabilities require students to develop a degree of trust in algorithmically generated outputs while simultaneously maintaining confidence in their ability to effectively utilize these systems. Consequently, students with higher levels of technology readiness are more likely to perceive AI chatbots as valuable educational resources, whereas students with lower readiness may remain hesitant despite recognizing potential benefits. Although TRT effectively explains variations in technological predisposition, it provides limited insight into the contextual and psychological pressures that may shape technology adoption behaviors. Specifically, the theory does not fully account for how academic stressors and emotional exhaustion influence students' motivations for engaging with technological tools. Therefore, an additional theoretical perspective is required to explain the role of psychological well-being in shaping AI chatbot adoption within demanding educational environments.

2.2 Job Demands-Resources Theory and Academic Burnout

The Job Demands-Resources (JD-R) Theory, initially proposed by Demerouti et al. (2001) and subsequently refined by Bakker and Demerouti (2007), offers a comprehensive framework for understanding the development of burnout and engagement across various occupational and educational contexts. Although originally developed within workplace settings, the theory has been widely applied to higher education environments due to its ability to explain how environmental demands and available resources jointly influence psychological outcomes.

According to JD-R Theory, every environment contains demands and resources. Demands refer to physical, cognitive, emotional, or organizational aspects that require sustained effort and may lead to psychological strain when excessive. Resources, by contrast, represent factors that assist individuals in achieving goals, reducing demands, or facilitating personal growth and development. Within higher education, academic workload, assessment pressures, project deadlines, performance expectations, and continuous evaluation constitute major academic demands. These demands are particularly pronounced in studio-based learning environments, where students engage in iterative design development, frequent critiques, prolonged project work, and intensive creative problem-solving activities. Such conditions often require sustained cognitive engagement and emotional investment, making students vulnerable to academic burnout.

Academic burnout is commonly conceptualized through three dimensions: emotional exhaustion, cynicism, and reduced academic efficacy. Emotional exhaustion reflects feelings of being emotionally and cognitively depleted by academic responsibilities. Cynicism represents psychological detachment and declining interest toward academic activities. Reduced academic efficacy refers to diminished confidence in one's ability to perform successfully and achieve desired learning outcomes. JD-R Theory suggests that burnout emerges when demands exceed available resources over an extended period. Within design education, students frequently encounter substantial demands associated with balancing creativity, technical proficiency, time constraints, and performance expectations. When these demands accumulate without adequate support mechanisms, burnout becomes increasingly likely.

Importantly, JD-R Theory also provides a useful lens for understanding the potential role of AI chatbots as educational resources. AI-powered conversational systems can function as cognitive support mechanisms by facilitating information retrieval, idea generation, feedback provision, and reflective inquiry. Through these functions, AI chatbots may help reduce cognitive workload and improve students' capacity to manage academic demands. Consequently, AI technologies can be conceptualized as emerging educational resources that potentially mitigate burnout while enhancing learning performance.

However, JD-R Theory also suggests a more complex possibility. While AI resources may reduce strain, excessive dependence on such resources may generate unintended consequences, including cognitive offloading, diminished reflective engagement, and increased technological dependency. Therefore, the relationship between burnout and AI adoption cannot be assumed to be universally positive or negative. Instead, AI chatbot usage may represent both a coping mechanism and a potential source of additional psychological complexity.

2.3 Integrating Technology Readiness Theory and JD-R Theory

While TRT explains why some students are naturally more inclined to adopt emerging technologies, JD-R Theory explains why students may seek technological support under conditions of academic pressure. The integration of these theories provides a more comprehensive explanation of AI chatbot adoption than either framework can offer independently. From a TRT perspective, students possessing high levels of optimism and innovativeness are more likely to perceive AI chatbots as useful and approachable educational tools. Their positive technological orientation increases the likelihood of experimentation and adoption regardless of situational pressures. Students characterized by discomfort and insecurity, however, may resist AI integration due to concerns regarding technological complexity, reliability, or ethical implications.

From a JD-R perspective, academic burnout introduces a contextual factor that may alter technology adoption behaviors. Students experiencing elevated burnout may increasingly seek external resources to manage academic demands. AI chatbots, by providing immediate assistance and cognitive support, may become attractive coping mechanisms for overwhelmed learners. Consequently, burnout may strengthen students' motivation to adopt AI tools despite varying levels of technological predisposition. The integration of TRT and JD-R Theory therefore suggests that AI chatbot adoption emerges from the interaction between individual technological predispositions and contextual psychological conditions. Technology readiness influences students' willingness and confidence to engage with AI systems, whereas academic burnout influences the perceived necessity of such systems as coping resources. Together, these factors create a more nuanced explanation of adoption behavior within studio-based learning environments.

This integrated perspective is particularly relevant for design education because studio pedagogy simultaneously demands technological adaptability and sustained creative effort. Students must navigate evolving digital ecosystems while managing intensive project workloads and iterative design processes. Under such conditions, AI chatbot adoption is unlikely to be determined solely by technological factors or psychological factors in isolation. Rather, adoption behaviors emerge from the dynamic interplay between readiness to engage with technology and the need to manage academic pressures. Accordingly, this study proposes that technology readiness functions as a primary antecedent of AI chatbot adoption, while academic burnout serves as a contextual psychological condition that influences the strength and direction of this relationship. The integration of TRT and JD-R theory, therefore, establishes a comprehensive theoretical foundation for examining AI chatbot adoption within studio-based learning and provides the basis for the conceptual framework proposed in this paper.

3. PROPOSED CONCEPTUAL FRAMEWORK

3.1 Conceptual Framework Development

The increasing integration of artificial intelligence (AI) chatbots in higher education has created a need to understand the factors that influence students' willingness to adopt these technologies. While previous studies have extensively investigated technology adoption through technological, behavioral, and pedagogical perspectives, limited attention has been given to the combined influence of students' technological predispositions and psychological well-being within studio-based learning environments. To address this gap, the present study proposes an integrated conceptual framework that combines Technology Readiness Theory (TRT) and Job Demands–Resources (JD-R) Theory to explain AI chatbot adoption among students engaged in studio-based learning.

The framework positions technology readiness as the primary antecedent of AI chatbot adoption. According to TRT, students who exhibit higher levels of optimism and innovativeness are more likely to perceive AI chatbots as useful learning resources and demonstrate greater willingness to integrate them into academic activities. Conversely, students characterized by discomfort and insecurity may exhibit resistance toward AI technologies due to concerns regarding complexity, reliability, or trustworthiness. Building upon the JD-R perspective, academic burnout is introduced as a contextual psychological condition that influences how students respond to academic challenges. Studio-based learning environments are often characterized by demanding workloads, iterative project development, continuous critique, and intensive creative problem-solving activities. These demands frequently contribute to emotional exhaustion, cynicism, and reduced academic efficacy. Under such circumstances, students may increasingly seek external support mechanisms capable of alleviating cognitive strain and improving productivity. AI chatbots represent a potential educational resource within the JD-R framework. By facilitating brainstorming, information retrieval, feedback generation, and reflective inquiry, AI chatbots may reduce cognitive workload and assist students in managing academic demands. Consequently, students experiencing moderate levels of burnout may demonstrate stronger tendencies to adopt AI technologies as coping mechanisms.

The framework proposes that technology readiness directly influences AI chatbot adoption, while Academic Burnout moderates this relationship. Specifically, burnout may strengthen the relationship between technology readiness and AI adoption because students experiencing higher academic demands are more motivated to utilize AI-assisted learning tools. However, excessive burnout may also weaken engagement by reducing students' motivation and cognitive capacity. Therefore, the relationship is expected to be complex and context dependent. Within this framework, Studio-Based Learning serves as the contextual setting in which these relationships occur. The unique characteristics of the studio pedagogy, including project-based learning, reflective practice, iterative design development, and frequent assessment, create conditions that intensify both technology usage and psychological pressures. Consequently, the proposed framework provides a holistic explanation of AI chatbot adoption by integrating technological predispositions with psychological experiences within creative educational environments.

3.2 Proposed Conceptual Model

Technology Readiness
(Optimism, Innovativeness,
Discomfort, Insecurity)
|
V
AI Chatbot Adoption
(Use, Intention, Continued Use)
^
|
Academic Burnout
(Exhaustion, Cynicism,
Reduced Academic Efficacy)
[Moderator]

Studio-Based Learning Environment
(Project Work, Critique, Reflection, Creativity)

Fig. 1 *Propose Conceptual Framework: "An Integrated Technology Readiness–Burnout Framework for AI Chatbot Adoption in Studio-Based Learning"*

3.3 Theoretical Contribution of The Framework

The proposed framework contributes to existing literature in three important ways. First, it extends Technology Readiness Theory beyond conventional technology adoption contexts by applying it to generative AI-powered educational tools. Second, it introduces Academic Burnout as a contextual psychological factor capable of influencing technology adoption behavior within higher education. Third, it provides a novel theoretical explanation for AI chatbot adoption within studio-based learning environments, where creative demands, reflective practice, and intensive project workloads create unique educational conditions which are not adequately addressed by existing technology adoption models. By integrating the TRT and JD-R Theory, the framework advances a more comprehensive understanding of how technological predispositions and psychological well-being jointly shape AI chatbot adoption in contemporary design education.

4. DISCUSSION

4.1 Interpretation of Proposed Framework

The proposed conceptual framework provides a more integrated explanation of AI chatbot adoption in studio-based learning by combining individual technological predispositions (Technology Readiness) with contextual psychological conditions (Academic Burnout). This integration extends existing technology adoption literature, which has traditionally emphasized cognitive and behavioral intention models, by incorporating emotional and stress-related dimensions that are particularly relevant in high-intensity learning environments. From a theoretical standpoint, Technology Readiness operates as a stable individual-level determinant that shapes students' initial openness toward AI chatbot usage. Students with higher levels of optimism and innovativeness are more likely to perceive AI chatbots as beneficial learning companions, while those with higher discomfort and insecurity are more likely to resist adoption. However, the framework suggests that this predisposition alone is insufficient to fully explain AI usage behavior in studio environments, where psychological strain significantly alters decision-making processes. Academic Burnout introduces a dynamic contextual condition that influences how students respond to technological opportunities. Within studio-based learning, burnout emerges from sustained cognitive demands, iterative design processes, and continuous evaluation cycles. The framework proposes that burnout does not simply reduce learning capacity, instead, it reshapes students' behavioral strategies by increasing their tendency to seek external support systems such as AI chatbots. This dual role positions burnout as both a potential inhibitor and a motivator for technology adoption, depending on its intensity and the student's coping strategies.

4.2 Theoretical Implications

The integration of Technology Readiness Theory and the Job Demands–Resources (JD-R) Theory contributes to the expansion of AI adoption literature in three significant ways.

First, the framework extends the Technology Readiness Theory beyond its traditional application in consumer and information system contexts by situating it within AI-driven educational environments. Unlike conventional technologies, AI chatbots actively participate in knowledge construction processes, thereby requiring a higher degree of cognitive trust and interpretive engagement from learners. This shift highlights the need to reconsider readiness not only as technological confidence but also as readiness for co-cognitive interaction with intelligent systems.

Second, by incorporating Academic Burnout, the framework introduces a psychological strain perspective into AI adoption research. While existing models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) focus primarily on perceived usefulness and ease of use, they often overlook the emotional and cognitive fatigue experienced by learners. The inclusion of burnout allows for a more realistic representation of student behavior in demanding academic environments, particularly in studio-based disciplines.

Third, the interaction between Technology Readiness and Academic Burnout provides a more nuanced explanation of AI adoption behavior. Rather than assuming linear relationships, the framework acknowledges that adoption is contingent upon both capability (readiness) and necessity (burnout). This dual-path explanation contributes to a more balanced understanding of why students adopt AI tools under different psychological conditions.

4.3 Pedagogical Implications for Studio-Based Learning

The findings of this conceptual framework have important implications for educators and curriculum designers in studio-based learning environments. Studio pedagogy is traditionally characterized by experiential learning, iterative design development, and reflective critique. While these characteristics foster creativity and deep learning, they also generate significant cognitive and emotional demands that may lead to burnout.

The introduction of AI chatbots into this environment presents both opportunities and challenges. On one hand, AI tools can function as cognitive scaffolds that support ideation, enhance productivity, and provide immediate feedback during the design process. This can reduce cognitive overload and allow students to focus more effectively on higher-order creative tasks. On the other hand, excessive reliance on AI may weaken students' reflective engagement and reduce opportunities for independent critical thinking. Educators therefore need to carefully position AI chatbots as learning partners rather than replacements for design thinking processes. This requires structured integration strategies that encourage students to use AI tools for exploration and augmentation rather than final solution generation. Such an approach aligns with constructivist and studio-based pedagogical principles, which emphasize process over product.

Furthermore, the framework suggests that educators should be attentive to students' psychological states when designing AI-supported learning activities. Students experiencing higher levels of burnout may benefit more from structured AI assistance, whereas students with lower burnout levels may require guidance that emphasizes independent exploration and critical reflection. This highlights the importance of adaptive pedagogical strategies that respond to varying student needs.

4.4 Practical Implications for Higher Education Institution

From an institutional perspective, the framework underscores the need for comprehensive AI integration policies that address both technological readiness and student well-being. Universities should not only focus on providing access to AI tools but also invest in developing students' competencies in using these tools responsibly and effectively.

First, institutions should implement AI literacy programs that include prompt engineering, critical evaluation of AI-generated content, and ethical awareness. These programs can enhance the students' technology readiness while ensuring that AI adoption is aligned with academic integrity standards.

Second, mental health and academic well-being support systems should be strengthened to mitigate the effects of academic burnout. Since burnout influences how students engage with AI tools, addressing psychological strain is essential for ensuring that AI adoption leads to positive learning outcomes rather than dependency or disengagement.

Third, institutional guidelines should clearly define the role of AI chatbots in academic work. Without clear boundaries, students may develop inconsistent usage patterns that lead to academic misconduct or over-reliance on automated outputs. Establishing transparent policies can help balance innovation with responsibility.

5. FUTURE RESEARCH DIRECTIONS

The proposed conceptual framework integrating Technology Readiness, Academic Burnout, and AI chatbot adoption in studio-based learning opens several important avenues for future empirical and theoretical investigation. While the current study provides a structured theoretical synthesis, its conceptual nature necessitates further validation and extension across diverse educational contexts, methodological approaches, and psychological dimensions.

5.1 Empirical Validation of the Proposed Framework

A primary direction for future research is the empirical testing of the proposed relationships using quantitative and mixed-method approaches. Structural Equation Modelling (SEM), particularly Partial Least Squares SEM (PLS-SEM), is suitable for examining the direct and moderating effects within the framework. Future studies may operationalize Technology Readiness, Academic Burnout, and AI chatbot adoption using validated measurement scales to test the strength and direction of the proposed relationships. Additionally, longitudinal research designs are recommended to capture how AI adoption behaviors evolve over time. Since both technology readiness and burnout are dynamic in nature, cross-sectional studies may not fully capture their fluctuating influence on AI engagement. Longitudinal tracking would allow researchers to identify whether sustained exposure to AI tools reduces burnout or, conversely, contributes to dependency and cognitive fatigue.

5.2 Expansion of Mediating and Moderating Variables

Future research should extend the current model by introducing additional mediating and moderating variables to enhance explanatory power. One important potential mediator is perceived usefulness of AI chatbots, which may explain how Technology Readiness translates into actual adoption behavior. Similarly, perceived ease of use and trust in AI systems may further refine understanding of user acceptance mechanisms. On the moderating side, variables such as AI literacy, digital self-efficacy, and prior experience with generative AI tools may significantly influence adoption patterns. Students with higher AI literacy may demonstrate stronger adoption behavior even under low technology readiness conditions, while those with low literacy may underutilize AI tools despite high burnout levels.

5.3 Contextual Diversification Across Disciplines

Although this study focuses on studio-based learning environments, future research should examine whether the proposed framework holds across different academic disciplines. Fields such as engineering, business, health sciences, and humanities may exhibit different patterns of AI adoption due to variations in workload structure, cognitive demands, and assessment methods. Comparative studies between design-based disciplines and non-design disciplines would be particularly valuable in determining whether studio pedagogy intensifies or modifies the interaction between Technology Readiness and Academic Burnout. Such comparative analyses would contribute to the generalizability of the framework across higher education contexts.

5.4 Qualitative Exploration of Student Experiences

In addition to quantitative validation, qualitative research is needed to deepen understanding of how students perceive and interact with AI chatbots in learning environments. Methods such as phenomenological interviews, focus group discussions, and design ethnography can uncover nuanced insights into students' emotional responses, cognitive strategies, and ethical concerns related to AI usage. Such studies may reveal how students negotiate the tension between efficiency and creativity when using AI tools, as well as how they interpret the role of AI in shaping their identity as designers or learners. This would complement the structural relationships proposed in the conceptual model with rich contextual understanding.

5.5 Investigation of Long-Term Cognitive and Creative Impacts

Another critical research direction involves examining the long-term effects of AI chatbot usage on students' cognitive development and creative abilities. While AI tools may enhance short-term productivity, their impact on critical thinking, problem-solving skills, and creative originality remain underexplored. Future studies should investigate whether sustained AI usage leads to cognitive offloading or whether it can support higher-order cognitive development through scaffolded learning experiences. In particular, future studies should examine whether the students are able to maintain independent thinking skills after prolonged exposure to AI-assisted environments.

5.6 Ethical Governance and Responsible AI Integration

Future research should also explore institutional governance models for responsible AI integration in higher education. As AI chatbots become increasingly embedded in academic workflows, questions of academic integrity, authorship, and ethical usage become more complex. Studies may examine the effectiveness of institutional policies, AI usage guidelines, and digital literacy training programs in promoting ethical engagement with AI tools. Additionally, research should consider how educators can balance encouraging innovation with maintaining academic standards and preserving authentic student learning outcomes.

5.7 Psychological Well-Being and AI Dependency

Given the central role of Academic Burnout in the proposed framework, future research should further investigate the psychological consequences of AI chatbot reliance. While AI tools may serve as coping mechanisms for academic stress, excessive reliance may lead to dependency, reduced autonomy, and increased anxiety when systems are unavailable or unreliable. Future studies should explore the boundary conditions between healthy AI-assisted learning and problematic dependency. Constructs such as technostress, digital fatigue, and emotional attachment to AI systems ("algorithmic intimacy") may be incorporated to better understand the psychological risks associated with AI integration.

5.8 Conclusion of Research Directions

In summary, the proposed conceptual framework provides a foundation for a wide range of future research opportunities spanning empirical validation, theoretical expansion, contextual comparison, qualitative inquiry, cognitive impact analysis, ethical governance, and psychological well-being. Addressing these research directions will not only strengthen the academic understanding of AI chatbot adoption in higher education but also support the development of more sustainable, ethical, and student-centered AI-enhanced learning environments.

6. ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to Universiti Teknologi MARA (UiTM) Perak for providing the academic environment and intellectual support necessary for the development of this study. Appreciation is also extended to colleagues and academic peers within the Interior Architecture program for their constructive discussions and insights that contributed to the refinement of this conceptual work. The author acknowledges the foundational contributions of previous researchers whose scholarly works have informed the theoretical development of this paper. Their efforts in advancing research on generative artificial intelligence, technology readiness, and academic well-being in higher education have been invaluable in shaping the direction of this study. Finally, gratitude is extended to all individuals who have indirectly supported this research through encouragement and motivation throughout the writing process.

7. FUNDING

The author(s) received no specific grant or financial support from any funding agency in the public, commercial, or not-for-profit sectors for the preparation of this conceptual paper.

8. AUTHORS' CONTRIBUTIONS

The author is solely responsible for the conceptualization, literature synthesis, theoretical development, and writing of this manuscript. The author also reviewed and approved the final version of the paper.

We certify that the article is the Authors' and Co-Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication, nor has it been published in whole or in part elsewhere. We testify to the fact that all Authors have contributed significantly to the work, validity and legitimacy of the data and its interpretation for submission to IJELHE.

9. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

The author acknowledges the use of Google Gemini Pro, ChatGPT, and Jenni AI during the preparation of this manuscript to assist with language editing and improvement of readability. These tools were not used to generate original research content or conclusions. The author has reviewed, verified, and revised all AI-assisted outputs and assumes full responsibility for the accuracy and integrity of the manuscript.

10. DATA AVAILABILITY/SUPPLEMENTARY MATERIALS

Data sharing is not applicable to this article as no new datasets were generated or analyzed during the current study. This is a conceptual paper based on a synthesis of existing literature and theoretical development. Therefore, no supplementary data, code, or additional materials are associated with this manuscript.

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