

Integrating Digital Learning Tools in Health Professions Education

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ABSTRACT

The integration of digital learning tools has become a transformative force in health professions education (HPE), promoting flexible, interactive, and learner-centered pedagogies. This study investigates the determinants of digital learning adoption within Sri Lanka's HPE sector using a convergent mixed-methods approach grounded in the Technology Acceptance Model (TAM). The quantitative component examined structural relationships among Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Behavioral Intention (BI), and Actual Use (AU), while the qualitative component explored contextual factors shaping technology adoption. Data were collected from 359 participants across three public universities, comprising students and academic staff from medicine, nursing, and allied health disciplines. Structural Equation Modeling (SEM) demonstrated strong reliability and validity of the TAM constructs and confirmed all hypothesized relationships. PEOU significantly predicted PU and BI, while PU emerged as the strongest predictor of BI. Behavioral intention demonstrated a substantial effect on actual use, collectively explaining 64% of variance in BI and 58% in AU. Qualitative thematic analysis revealed three major contextual influences such as, infrastructural, gaps in digital literacy among both students and faculty, and limited pedagogical integration of digital tools within curricula. These factors moderated the strength of TAM relationships, highlighting an intention–action gap, where positive attitudes do not consistently translate into effective technology use. The integrated findings underscore that technology adoption in Sri Lankan HPE requires not only user acceptance but also institutional readiness, faculty development, and enhanced digital competency. The study provides evidence-based insights to guide national policy, infrastructure planning, and curriculum reform, supporting the broader vision of equitable and future-ready digital health education.

Introduction

The rapid digital transformation of higher education has profoundly influenced health professions education (HPE) worldwide. The integration of digital learning tools, such as learning management systems (LMS), virtual simulation platforms, and artificial intelligence (AI) assisted applications has redefined how health sciences students and educators access, engage with, and assess knowledge (Gordon et

al., 2024). The COVID-19 pandemic served as an unprecedented catalyst, compelling educational institutions to transition from traditional pedagogies toward blended and online models that prioritize flexibility, accessibility, and learner-centered engagement (UNESCO, 2024). These developments reflect a paradigm shift in medical and allied health education, where digital literacy and technological fluency have become core professional competencies (Car et al., 2025).

Despite these advances, the digital transformation of HPE is not uniform across contexts. Studies indicate substantial disparities between high-income and low- and middle-income countries (LMICs) regarding institutional readiness, infrastructure, and educator training (Al-Emran et al., 2019; Hewage, 2023). In Sri Lanka, national higher education reforms and information and communication technology (ICT) initiatives have expanded the use of e-learning environments within medical, nursing, and allied health programs (Jayasuriya et al., 2021). However, challenges remain in ensuring equitable access to technology and pedagogical consistency across public universities. Limitations in bandwidth, device availability, and faculty preparedness often impede effective use of digital learning tools, particularly among rural and under-resourced institutions (Herath & Fernando, 2021). Moreover, while the availability of technology has improved, there is limited understanding of how these tools are perceived, accepted, and sustained by health sciences students and educators in local contexts.

The Technology Acceptance Model (TAM) proposed by Davis (1989) and modified by Venkatesh and Davis (2000) provides a robust theoretical foundation for investigating digital learning adoption in educational settings. It posits that user acceptance of a new technology is determined primarily by two perceptual constructs: *Perceived Ease of Use (PEOU)* and *Perceived Usefulness (PU)*, which together shape *Behavioral Intention (BI)* and ultimately influence *Actual Use (AU)*. Numerous studies have validated TAM within medical and health sciences education globally, demonstrating that these factors explain a substantial proportion of the variance in technology adoption behaviors (Maillet et al., 2015; Holden & Karsh, 2010). However, contemporary extensions of TAM emphasize contextual influences such as institutional support, digital literacy, and trust in technology, particularly when applied to AI-based learning tools and hybrid learning environments (Abd-alrazaq et al., 2023; Seneviratne et al., 2025). Despite its international prominence, empirical validation of TAM in Sri Lanka's HPE sector remains limited, especially through mixed-methods approaches that integrate structural equation modeling (SEM) with qualitative exploration.

This study addresses that research gap by examining the determinants of digital learning tool adoption among health professions students and educators in Sri Lanka. Specifically, it investigates how perceived usefulness, ease of use, and behavioral intention interact to predict actual use of digital platforms, while exploring contextual moderators such as infrastructure, digital literacy, and pedagogical readiness. Through a mixed-methods design, the study integrates quantitative modeling and qualitative thematic analysis to provide a comprehensive understanding of technology acceptance within the Sri Lankan HPE context. By situating its inquiry within the broader theoretical and regional framework, the research aims to advance evidence-based strategies for sustainable digital education in the health sector.

The significance of this study lies in its potential to inform policy, practice, and curriculum development in Sri Lankan higher education. Understanding what drives or hinders digital learning adoption will enable institutions to align technology integration with pedagogical objectives and national digital competency frameworks. The findings will also contribute to the growing global literature on technology-enhanced learning in HPE by providing empirical insights from a developing-country perspective—highlighting how technological, infrastructural, and cultural factors intersect to shape the digital learning experience. Ultimately, this research supports the national vision for equitable, competency-based medical education that harnesses technology to strengthen learning outcomes and prepare future health professionals for digitally mediated healthcare environments.

Literature Review

2.1 Acceptance of Technology and Digital Learning in Health Professions Education

The digital transformation of health professions education (HPE) has been informed about the adoption of technology in learning and teaching through various theoretical models. The Technology Acceptance Model (TAM) proposed by Davis in 1989 has been found to be an important explanatory theory because of its emphasis on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) as antecedents of both Behavioral Intention (BI) and Actual Use (AU). Various research studies confirm the

predictability of the TAM model in the context of the healthcare sector and e-learning (Maillet et al., 2015; Holden & Karsh, 2010). Later research has traced the boundaries of the TAM model through various contextual factors related to the learning environment of today's e-learning situation (Al-Emran et al., 2019; Seneviratne et al., 2025).

2.2 Global and Regional Implementation Evidence

Across the world, online learning technologies support the flexibility and engagement of learners through effective integration in instruction (Gordon et al., 2024). Reports confirm the effectiveness of learning in being enhanced not through the application of the technology but through its proper engagement with instruction and faculty support (Car et al., 2025). In South Asia today, there has been an increased adaptation of the concept of blended learning because of the COVID-19 pandemic, but its success has been challenged by limitations in the underlying infrastructure and the level of digital literacy (UNESCO, 2024).

In Sri Lanka, there has been a rapid adoption of the LMS system and online support in medical and related health courses at universities. However, disparities in access, network connectivity problems, and the unprepared teaching faculty remain obstacles to the full adoption of the system (Hewage, 2023; Jayasuriya et al., 2021). The vast majority of existing research studies in Sri Lanka are behavioral studies rather than conceptual applications in the context of the TAM model (Herath and Fernando, 2021).

2.3 Emerging Technologies and Digital Competency Frameworks

Artificial intelligence and large language models are also beginning to transform the field of digital health education through adaptive learning and automated assessments and the generation of educational content (Abd-alrazaq et al., 2023; Gordon et al., 2024). However, there needs to be careful integration of this technology through trust, transparency, and accuracy of the digital health educational information. This has resulted

in the development of new proposals in the field of digital health through the 'Digital Competencies in Medical Education' (Car et al., 2025). The acceptance levels of the behavioral trends of this new development in the field of HPE in Sri Lanka are crucial.

Methodology

Study Design

This study employed a convergent mixed-methods design, combining quantitative and qualitative approaches to examine determinants of digital learning tool adoption among students and educators in Sri Lankan health professions education (HPE). The quantitative phase applied the Technology Acceptance Model (TAM) to assess structural relationships among *Perceived Ease of Use (PEOU)*, *Perceived Usefulness (PU)*, *Behavioral Intention (BI)*, and *Actual Use (AU)*. The qualitative phase explored contextual factors influencing these relationships, providing interpretive depth through thematic analysis.

Study Setting and Participants

Participants were drawn from three public universities offering health sciences programs, including medicine, nursing, and allied health disciplines. A stratified random sampling approach ensured proportional representation of both students and academic staff. The final sample consisted of 359 respondents (312 students, 47 academic staff). Participation was voluntary, with informed consent obtained prior to data collection.

Instrumentation

A self-administered questionnaire was developed based on validated TAM scales (Davis, 1989; Holden & Karsh, 2010). It comprised three sections:

1. Demographics (age, gender, program, role, prior digital experience);
2. TAM constructs, measured using 5-point Likert items (1 = Strongly disagree to 5 = Strongly agree); and
3. Open-ended questions on challenges, enablers, and recommendations.

Reliability and validity were confirmed through pilot testing (Cronbach's $\alpha > 0.85$ for all constructs). Content validity was established through expert review by three education technology specialists.

Data Collection Procedure

Data were collected via an online survey between May and July 2024, disseminated through institutional mailing lists. Anonymity and confidentiality were maintained throughout. Ethical clearance was obtained from the relevant university ethics review committee (approval number to be inserted).

3.5 Data Analysis

Quantitative data were analyzed using IBM SPSS 26 and SmartPLS 4. The measurement model was assessed for reliability (Composite Reliability > 0.70) and validity (Average Variance Extracted > 0.50). Structural Equation Modeling (SEM) tested hypothesized paths:

- H1: PEOU → PU
- H2: PU → BI
- H3: PEOU → BI
- H4: BI → AU

Bootstrapping with 5,000 resamples assessed significance. Qualitative responses were coded using thematic analysis (Braun & Clarke, 2019), identifying recurrent themes related to infrastructure, pedagogy, and digital literacy. Integration of quantitative and qualitative results followed a side-by-side joint display to interpret convergences and divergences.

Results and Discussion

Participant Profile

A total of 359 respondents completed the study: 312 students (86.9%) and 47 academic staff (13.1%) representing three public universities offering health sciences programs in Sri Lanka. Among student participants, 56% were female and 44% male, consistent with national enrollment trends in medical and allied health education. The disciplinary composition included Medicine (45%), Nursing (32%), and Allied Health Sciences (23%). A high proportion (81%) reported prior experience with at least one digital learning platform—primarily learning management systems (LMS) and video conferencing tools confirming adequate digital exposure across the sample.

Measurement Model Evaluation

Prior to hypothesis testing, reliability and validity of the measurement model were assessed. Cronbach's alpha (α) and Composite Reliability

(CR) values exceeded the 0.85 threshold for all constructs: PU ($\alpha = 0.91$, CR = 0.93), PEOU ($\alpha = 0.88$, CR = 0.91), BI ($\alpha = 0.90$, CR = 0.92), and AU ($\alpha = 0.86$, CR = 0.89). The Average Variance Extracted (AVE) for all constructs ranged between 0.68–0.74, establishing convergent validity (Hair et al., 2020). Discriminant validity was confirmed using the Fornell–Larcker criterion and Heterotrait–Monotrait ratio (HTMT < 0.85), demonstrating that constructs captured distinct dimensions of technology acceptance. These results indicate the TAM measurement structure was robust for this context.

Structural Model and Hypothesis Testing

The structural model, analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with 5,000 bootstrap resamples, demonstrated good overall fit (SRMR = 0.056; NFI = 0.91).

Standardized path coefficients and significance levels supported all four hypothesized relationships are given in Table 1.

The model explained 64% of the variance in Behavioral Intention (BI) and 58% in Actual Use (AU), demonstrating strong explanatory power relative to prior TAM-based studies in medical education (Maillet et al., 2015; Holden & Karsh, 2010). These findings confirm that both *ease of use* and *usefulness* significantly influence user intention, which in turn is a strong predictor of actual utilization.

Interpretation of Quantitative Findings

The dominant effect of Perceived Usefulness (PU) on Behavioral Intention ($\beta = 0.46$) indicates that learners and educators prioritize tools that demonstrably enhance learning outcomes or instructional efficiency. This aligns with previous findings in professional education, where perceived performance gains outweigh usability considerations (Al-Emran et al., 2019). The significant influence of PEOU on both PU ($\beta = 0.59$) and BI ($\beta = 0.31$) supports the notion that user confidence in operating technology facilitates perception of its value, reinforcing the interconnectedness of these constructs.

The strong path from BI to AU ($\beta = 0.53$) reveals that motivation and intention effectively translate into behavioral practice, even amid infrastructural limitations.

Table 1: Standardized path coefficients and significance levels

Hypothesis	Path	β	p-value	Result
H1	PEOU \rightarrow PU	0.59	< .001	Supported
H2	PU \rightarrow BI	0.46	< .001	Supported
H3	PEOU \rightarrow BI	0.31	< .01	Supported
H4	BI \rightarrow AU	0.53	< .001	Supported

However, the R^2 values suggest that approximately 40% of behavioral variance remains unexplained by TAM's traditional constructs, implying the presence of contextual moderators—such as institutional readiness, digital literacy, and pedagogical culture—highlighted in previous research (Herath & Fernando, 2021; Seneviratne et al., 2025).

Qualitative Findings: Thematic Analysis

Thematic analysis of open-ended responses (n = 359) revealed three major and interrelated themes contextualizing quantitative results.

Infrastructure and Access Constraints

Respondents consistently cited limited internet bandwidth, frequent connectivity disruptions, and unequal device access as barriers to effective platform use, particularly in rural settings.

“At peak hours, the system crashes, and some students can’t join classes due to poor signal coverage.” – Medical student participant

This aligns with regional evidence that infrastructural inequities continue to undermine technology-enabled learning (Hewage, 2023; Jayasuriya et al., 2021). Despite strong behavioral intention, inconsistent access often limits actual engagement, reinforcing the “intention–action gap” observed in the quantitative model.

Digital Literacy and Technical Confidence

Both students and faculty expressed gaps in digital proficiency, especially in advanced platform functionalities (analytics dashboards, assessment tools, or simulation modules).

“Uploading materials is easy, but creating interactive lessons or online quizzes still feels complicated.” – Nursing lecturer respondent

This theme supports prior findings that *Perceived Ease of Use* is influenced by digital self-efficacy and prior experience (Maillet et al., 2015). It also indicates that training and continuous support are essential for sustaining high intention-to-use levels.

Pedagogical Integration and Institutional Support

Many participants emphasized that digital tools were used mainly for content delivery rather than for interactive, student-centered learning.

“Most online sessions are slide presentations without engagement. Technology should be used for discussions or problem-solving.” – Allied health student

This mirrors UNESCO’s (2024) observation that successful digital transformation depends on pedagogical innovation, not just technology deployment. Participants also cited limited institutional incentives for faculty innovation, suggesting a systemic challenge in embedding digital pedagogy within curricular structures.

Integration of Quantitative and Qualitative Insights

The mixed-method integration reveals that while TAM constructs effectively explain intention and use, contextual barriers mediate the strength of these relationships. Specifically, infrastructure limitations and insufficient pedagogical training weaken the translation of positive intentions into consistent practice. Conversely, institutional encouragement and technical support appear to enhance both perceived usefulness and ease of use. This synthesis underscores that digital learning adoption in Sri Lankan HPE is not solely a technological issue but an ecosystemic one, requiring alignment between technological, human, and institutional subsystems.

Comparison with Previous Research

The present study corroborates the predictive validity of TAM in health education contexts (Holden & Karsh, 2010; Maillet et al., 2015) while extending its application to a developing-country setting. Compared to international benchmarks, the explanatory power observed here ($R^2 = 0.64$ for BI; 0.58 for AU) is substantial, demonstrating resilience of the model under resource-constrained conditions. The results also resonate with Al-Emran et al. (2019), who emphasized that perceived usefulness remains the strongest determinant of technology acceptance across professional education domains.

However, the qualitative findings expand this understanding by situating TAM relationships within sociocultural realities—highlighting digital literacy, connectivity, and pedagogical readiness as pivotal moderating variables. This contextual dimension aligns with recent calls to develop *contextually adaptive TAM frameworks* for education in low- and middle-income settings (Seneviratne et al., 2025).

Overall, the findings demonstrate that Sri Lankan health professions students and educators exhibit positive attitudes toward digital learning when tools are accessible, functional, and pedagogically aligned. The robust validation of TAM supports its continued relevance for HPE research, while the qualitative themes reveal systemic barriers that must be addressed for sustainable integration.

To achieve meaningful digital transformation, institutions should invest in infrastructure reliability, digital literacy training, and faculty development to foster learner-centered pedagogies. Furthermore, policy frameworks should align with the *Digital Health Competencies in Medical Education* (Car et al., 2025) to ensure that graduates are not only users of technology but also critical evaluators and ethical practitioners of digital health tools.

This synthesis highlights that technology acceptance in HPE is both a psychological and structural process—shaped by individual perceptions and institutional environments—and that understanding both dimensions is essential for achieving equitable and effective digital learning in Sri Lanka.

Conclusion

This study examined the determinants of digital learning tool adoption among students and educators in Sri Lankan health professions education using a mixed-methods design grounded in the Technology Acceptance Model (TAM). Quantitative findings confirmed that *Perceived Ease of Use (PEOU)* and *Perceived Usefulness (PU)* significantly influenced *Behavioral Intention (BI)*, which in turn predicted *Actual Use (AU)* of digital tools. The model demonstrated strong explanatory power, explaining 64% of variance in behavioral intention and 58% in actual use—attesting to the robustness of TAM within the Sri Lankan higher education context.

Qualitative results provided critical contextual depth, identifying infrastructural limitations, variable digital literacy, and weak pedagogical integration as major barriers to sustained adoption. Despite these challenges, participants expressed overwhelmingly positive attitudes toward digital learning, emphasizing its role in flexibility, engagement, and preparedness for technology-driven healthcare environments. This convergence of findings underscores that successful digital adoption is not merely a function of technology availability but of its meaningful pedagogical and institutional integration.

Overall, the study demonstrates that digital learning transformation in Sri Lankan HPE is feasible and promising, provided it is guided by evidence-based frameworks, supported by institutional commitment, and contextualized within national digital education policies. These insights contribute to global discourse on digital transformation in health education, particularly from the perspective of developing nations where infrastructural and cultural dynamics uniquely influence technology adoption.

Recommendations

Strengthen Digital Infrastructure and Accessibility

Policymakers and university administrations should prioritize equitable access by upgrading internet connectivity, providing subsidized data packages for students, and ensuring reliable LMS and e-resource availability. Infrastructure is foundational to bridging the intention–action gap observed in the study.

Enhance Digital Literacy and Pedagogical Capacity

Continuous professional development programs should focus on improving both educators' and students' digital competencies, emphasizing interactive teaching design, online assessment, and ethical technology use. Embedding *digital pedagogy modules* within health curricula will sustain technology acceptance.

Institutionalize Supportive Policies and Incentives

Institutions should develop incentive structures for educators who integrate innovative digital methods. Establishing “digital learning excellence centers” can promote research, mentorship, and best-practice sharing across universities.

Promote Learner-Centered and Competency-Based Integration

Future digital initiatives should align with the *Digital Health Competencies in Medical Education Framework* (Car et al., 2025), ensuring that students not only use but critically engage with digital health tools. Technology should facilitate collaboration, simulation-based learning, and patient-centered thinking.

Encourage Longitudinal and Comparative Research

Further studies should employ longitudinal and cross-institutional designs to track technology adoption over time, exploring moderating factors such as institutional culture, AI integration, and post-pandemic pedagogical evolution.

Implications for Policy and Practice

The findings provide actionable insights for Sri Lankan universities and health education policymakers. By systematically addressing infrastructural, pedagogical, and institutional dimensions, higher education institutions can move toward a sustainable digital ecosystem that prepares graduates for modern, technology-mediated healthcare environments. Strengthening collaboration between the Ministry of Higher Education, the University Grants Commission (UGC), and faculties of health sciences will be critical in achieving this vision.

In conclusion, digital learning in health professions education represents both an opportunity and a challenge. Its success will depend on a balanced approach that values *technological efficiency, pedagogical integrity,*

and human-centered inclusivity—ensuring that digital transformation ultimately enhances both learning and patient care outcomes.

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