ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

Evaluating the Impact of ICT Integration on Students Learning Outcomes in Cambodian Public Universities

Chanbopheak Nguon[1*]; Dhakir Abbas Ali[2]

[1;2]Lincoln University College, Petaling Jaya, Malaysia
[1]School of Business and Management, Lincoln University College, Malaysia
[2]School of Business and Management, Lincoln University College, Malaysia

[2](https://orcid.org/0009-0000-6842-0157); [2](https://orcid.org/0009-0001-0368-9275)

Corresponding Author: Chanbopheak Nguon[1*]

Publication Date: 2025/09/10

Abstract: This study investigates the impact of Information and Communication Technology (ICT) integration, specifically ICT accessibility and ICT attitudes and beliefs on students' learning outcomes in Cambodian public higher education institutions. Grounded in a quantitative research design, data were collected from 326 valid students' responses across three major public universities. Structural Equation Modeling using SmartPLS 3.0 was employed to evaluate both the measurement and structural model. Results indicate that both ICT accessibility and ICT attitude and belief have statistically significant positive effects on student learning outcomes. ICT accessibility exhibited a stronger influence ($\beta = 0.345$, $t = 7.500$, $p = 0.000$) compared to ICT attitude and belief ($\beta = 0.197$, $t = 3.678$, $p = 0.000$). Despite these significant relationships, the structural model yielded a relatively low explanatory power, with $R^2 = 0.198$ and adjusted $R^2 = 0.193$, suggesting that ICT-related factors account for roughly 19.8% of the variance in learning outcomes. Effect size analysis showed small contributions from ICT accessibility ($f^2 = 0.135$) and ICT attitude and beliefs ($f^2 = 0.043$). Model fit was confirmed with SRMR = 0.069, well below the 0.10 threshold. The findings underscore the importance of both equitable ICT access and the cultivation of positive digital attitudes in enhancing educational outcomes. However, ICT alone does not sufficiency. Broader pedagogical and institutional reforms are essential to maximize the benefits of digital integration in Cambodian higher education.

Keywords: *Information and Communication Technology, ICT Accessibility, Student Attitude and Belief, Cambodian Higher Education, Learning Outcomes.*

How to Cite: Chanbopheak Nguon; Dhakir Abbas Ali (2025) Evaluating the Impact of ICT Integration on Students Learning Outcomes in Cambodian Public Universities. *International Journal of Innovative Science and Research Technology*, 10(9), 209-217. https://doi.org/10.38124/ijisrt/25sep239

I. INTRODUCTION

In the context of rapid technological advancement, Information and Communication Technology (ICT) has become a critical driver of innovation and transformation in higher education globally. In Cambodia, the integration of ICT into universities is reshaping pedagogical approaches, improving access, and enhancing the quality of teaching and learning. However, despite notable progress, the connection between ICT uses and student learning outcomes remains underexplored. While global research highlights the influence of students' confidence in using technology on academic success, limited empirical attention has been given to this relationship within Cambodian higher education. This study addresses this gap by examining how students' comfort and proficiency with digital tools affect their academic performance in an evolving educational landscape. The study further outlines the current state of ICT integration in Cambodia, defines key concepts, presents research objectives and questions, and highlights the significance and scope of the investigation.

In the digital era, ICT has emerged as a transformative force in reshaping pedagogical practices, particularly within higher education. The rapid global shift to online learning during the COVID-19 pandemic underscored the critical role of ICT in maintaining instructional continuity and revealed both opportunities and inequalities in educational access. ICT

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

accessibility, encompass not just the physical availability of devices and internet connectivity, but also the inclusivity and usability of digital tools that become foundational to ensuring equitable learning environments. In Cambodia, recent national strategies such as the EduTech Roadmap reflect growing institutional commitment to digital transformation. However, disparities in access to infrastructure and ICT-related skills, particularly in rural or under-resourced areas, continue to pose significant barriers to achieving consistent learning outcomes. Furthermore, the gaps can deepen inequalities if marginalized students are systematically unable to benefit from digital innovations, especially for female at university or working context. Equally important are students' attitudes and beliefs toward ICT, which significantly shape the effectiveness of technology integration. Positive perceptions such as viewing ICT as useful, relevant, and empowering are associated with greater student engagement and improved academic performance. These beliefs are influenced by factors including prior exposure, digital literacy, and socio-cultural context. Students who perceive ICT as beneficial are more likely to actively utilize digital learning tools, apply self-regulated learning strategies, and achieve better outcomes. Conversely, limited access or negative attitudes may lead to disengagement, underutilization of digital resources, and diminished educational returns. This study, grounded in the Cambodian higher education context, seeks to examine the interrelationship between ICT accessibility, students' attitudes and beliefs, and their academic outcomes. By focusing on both structural and psychological dimensions of technology use, it aims to provide actionable insights that support inclusive, student-centered digital learning strategies (Bandura, 1997; Saks, 2024; Su & Ali, 2024).

II. LITERATURE REVIEW

In contemporary higher education, the integration of Information and Communication Technology (ICT) is not merely a matter of infrastructure and access but hinges significantly on the psychological readiness of learners. Students' attitudes and beliefs toward ICT have been identified as central determinants in shaping their engagement with digital learning environments and, consequently, their academic outcomes. Attitudes deeply influence how students' approach and utilize ICT tools in their studies. When learners perceive ICT as relevant and beneficial to their academic success, they are more likely to participate actively in technology-mediated activities, apply digital strategies effectively, and persist in the face of technical challenges, all of which are positively correlated with improved learning outcomes. However, these attitudes and beliefs are not uniformly distributed among learners. They are often mediated by factors such as prior technological exposure, socioeconomic status, digital literacy, and institutional support (Jing & Ali, 2024a). Students from more privileged backgrounds or urban regions, for instance, typically have greater access to digital tools and are more familiar with using technology in daily life, which fosters more positive ICT perceptions. In contrast, students with limited exposure or negative prior experiences may develop skepticism, anxiety, or resistance toward the use of ICT in educational settings. These disparities can directly impact their academic engagement and performance, reinforcing educational inequities in digitally dependent systems (Iwadi et al., 2024). The construct of ICT self-efficacy, or students' beliefs in their ability to use technology effectively for academic tasks, plays a pivotal mediating role in this dynamic. Beliefs about personal competence with digital tools strongly influence learners' willingness to engage in self-regulated learning practices such as goal setting, progress monitoring, and reflective thinking. Students with high ICT self-efficacy not only demonstrate greater confidence in navigating online platforms and managing digital content but are also more resilient in overcoming technological difficulties. This, in turn, leads to deeper cognitive engagement, enhanced learning behaviors, and improved academic outcomes (Peng & Ali, 2025). Importantly, attitudes and beliefs are malleable and can be positively shaped through well-designed interventions, inclusive digital experiences, and consistent encouragement from educators. Research by (Alzahrani, 2023; Pan et al., 2024) underscores the strong correlation between students' attitudes toward ICT and their actual usage behaviors, indicating that fostering positive perceptions can significantly enhance the likelihood of effective technology adoption. Moreover, Yang (2023) found that students with strong ICT self-efficacy not only use digital tools more productively but also experience greater academic success, highlighting the link between psychological readiness and learning performance. Ultimately, the integration of ICT in higher education must be accompanied by intentional efforts to strengthen student attitudes and beliefs. Providing accessible training, nurturing supportive learning environments, and recognizing students' diverse starting points are essential strategies to bridge the gap between access and meaningful use. By fostering positive ICT-related attitudes and reinforcing beliefs in technological competence, higher education institutions can significantly enhance student motivation, learning outcomes, and long-term academic success, especially in resource-constrained and digitally emerging contexts.

In the context of an increasingly digitalized education landscape, the accessibility of Information and Communication Technology (ICT) in higher education has emerged as a critical determinant of inclusivity and educational quality. ICT accessibility refers not only to the physical availability of technological infrastructure but also to the extent to which digital environments accommodate diverse learner needs. Ensuring that ICT tools and platforms are accessible to all regardless of students' physical, cognitive, or socioeconomic backgrounds, is essential for promoting equitable participation in learning. As digital tools become integral to instruction, assessment, and student engagement, the risk of exclusion intensifies, particularly in resource-constrained settings where disparities in infrastructure and digital literacy are prevalent. True ICT accessibility extends beyond device distribution or network connectivity. It requires the intentional design of digital learning ecosystems that support usability for individuals with disabilities, limited prior exposure to technology, or socioeconomically disadvantaged backgrounds. This

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

involves adopting universal design principles, integrating assistive technologies, and developing content that adheres to recognized accessibility standards, such as the Web Content Accessibility Guidelines (WCAG). As emphasized by Alhassan & Adam (2021), the inclusion of features like alternative text for images, captioning for videos, and keyboard-friendly navigation not only supports students with impairments but also enhances usability for the broader student population. Such design choices contribute to a more flexible and responsive learning environment that accommodates varying learning styles and contexts. The successful implementation of ICT accessibility requires a coordinated and systemic approach within higher education institutions. This includes collaboration among information technology services, academic departments, student support offices, and institutional leadership. Beyond infrastructure provision, building institutional capacity through faculty training and awareness-raising is fundamental. Fernández-Gutiérrez et al. (2020) argue that a culture of accessibility, one that embeds inclusive thinking into all stages of curriculum design, delivery, and evaluation is essential to reducing digital barriers. Faculty and staff must be equipped not only with the technical knowledge to utilize ICT but also with the pedagogical strategies to apply it in ways that support all learners equitably. However, the relationship between ICT accessibility and educational outcomes is not linear. Studies have shown that mere access to technology does not automatically result in improved learning performance. The effectiveness of ICT integration depends significantly on how technologies are used and embedded into pedagogical practices. Without proper alignment between digital tools and instructional goals, technology may fail to support learning or may even become a distraction. Furthermore, accessibility gaps can deepen inequalities if marginalized students are systematically unable to benefit from digital innovations (Jing & Ali, 2024b). In developing country, where disparities in ICT infrastructure and digital skills are more pronounced, a strategic focus on accessibility is imperative. Institutions must move beyond viewing ICT as a standalone innovation and instead adopt a holistic, equity-driven approach to digital transformation. Ensuring that all students can meaningfully engage with digital education is not only a matter of compliance or inclusion—it is a foundational component of delivering quality, future-ready higher education.

➢ *Hypotheses and Theoretical Framework*

- *H1*: ICT attitude and beliefs has a positively significant influence on Cambodian Public Higher Education Learning Outcomes.
- *H2*: ICT accessibility has a positively significant influence on Cambodian Public Higher Education Learning Outcomes.

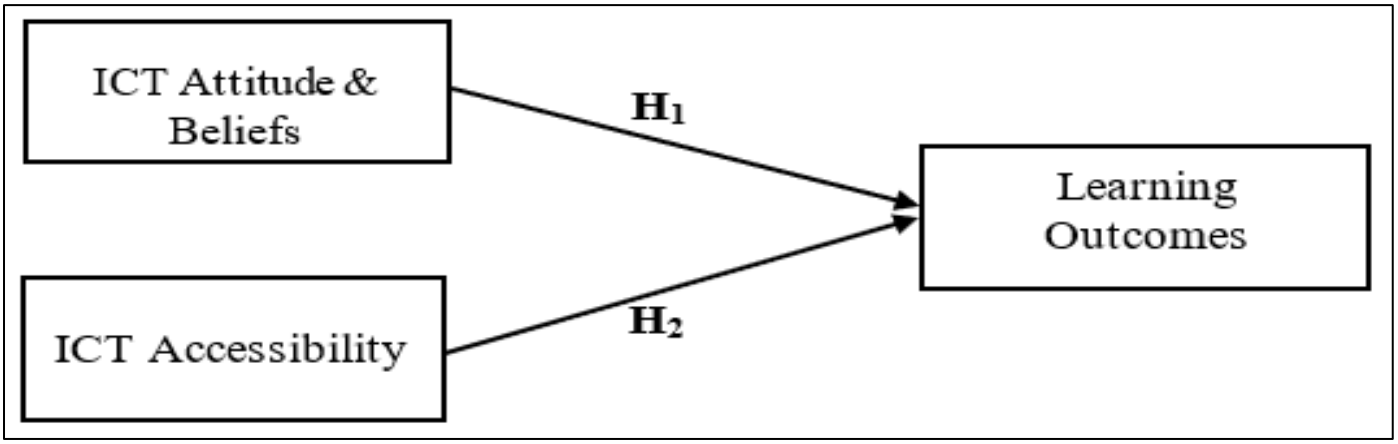

Fig 1 Theoretical Framework

III. METHODOLOGY

Research design denotes the structured plan selected to guide a study, shaped by its objectives and the problems it aims to investigate. Quantitative data are typically collected through closed-ended questions or statements, which are designed to address research questions related to attitudes, behaviors, or performance within human social groups (Bryman, 2016). According to Creswell & Creswell (2018), a population in research refers to the entire group of individuals or elements the study seeks to investigate. Similarly, Banerjee & Chaudhury (2010) define the population as a group of elements sharing a common characteristic, affinity, or sentiment. These definitions underscore the importance of clearly identifying and understanding the population to ensure the relevance and generalizability of research findings. Consequently, this study focuses on students from selected public universities in Cambodia, chosen for their representativeness and accessibility. Furthermore, as Krejcie & Morgan (1970) highlight, the increasing demand for rigorous research has driven the development of methods to determine an appropriate sample size that accurately represents the population under study.

Meanwhile, the questionnaire was meticulously developed using validated items corresponding to the study's key constructs. A pilot study was carried out to evaluate the

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

instrument's internal consistency and reliability. The results revealed that Cronbach's alpha coefficients for many of the constructs ranged from 0.713 to 0.900, thereby exceeding the commonly accepted threshold of 0.70 (Nunnally, 1978). Following the pilot validation, hard copies of the finalized questionnaires were distributed to students at selected 3 public universities in Cambodia to ensure efficient and effective data collection. In total, 384 hard-copy questionnaires were distributed to academic staff across selected public and private higher education institutions in Cambodia. This effort yielded 348 returned surveys, representing a response rate of approximately 90.6%. Upon screening the responses, 58 questionnaires were excluded due to substantial incomplete data. Consequently, 326 fully completed and valid questionnaires were retained for subsequent analysis. Thus, the overall response rate was 84.9%, which is considered acceptable for quantitative analysis. The study employed a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), to assess the primary constructs. The questionnaire was divided into four sections. Items addressing ICT attitude and belief were designed to reflect the technological context, drawing on established frameworks. Self-efficacy measures were adapted from previously validated scales, while learning outcomes was assessed using multiple dimensions based on prior educational research.

SmartPLS software was utilized in the present study to evaluate the proposed research framework, as it is a widely adopted tool for quantitative data analysis. Specifically, SmartPLS facilitated the assessment of the structural model, enabling the examination of the model's predictive capacity and the relationships among the constructs (Henseler et al., 2014). In this study, SmartPLS 3.0 was employed to estimate both the measurement model (external model), which involved evaluating constructs' consistency and strength, and the structural model (internal model), which assessed the hypothesized relationships between latent variables.

Table 1 The Demographic Characteristics of the Respondents

Factors	Classification	Repetition	Proportion
Gender	Male	155	47.5
	Female	171	52.5
Age	<20yrs	109	33.4
	20-22yrs	121	37.1
	23-25yrs	86	26.4
	25yrs >	10	3.1
Institutions	National University of Management	96	29.4
	Royal University of Phnom Penh	197	60.4
	National University of Battambang	33	10.1
N		**326**	

IV. RESULT

➢ *Measurement Model Evaluation*

Table 2, the reliability and validity of the constructs were confirmed using Cronbach's alpha, composite reliability (CR), AVE, and discriminant validity, following (Hair et al., 2017). All constructs demonstrated strong internal consistency (α and CR > 0.90) and convergent validity (AVE > 0.60). Items with loadings between 0.70 and 0.90 were r were kept in the model.

Table 2 Construct Reliability and Validity

Construct	Items	Loadings	Cronbach Alpha	Composite Reliability	Average Variance Extracted
ICT Accessibility	IA1	0.908	0.960	0.965	0.678
	IA10	0.856			
	IA11	0.751			
	IA15	0.840			
	IA16	0.811			
	IA18	0.901			
	IA2	0.797			
	IA3	0.836			
	IA4	0.721			
	IA6	0.824			
	IA7	0.748			
	IA8	0.860			
	IA9	0.829			
ICT Attitude and Belief	IAB1	0.880	0.983	0.984	0.819
	IAB10	0.927			
	IAB11	0.855			
	IAB12	0.946			
	IAB14	0.953			

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

Construct	Items	Loadings	Cronbach Alpha	Composite Reliability	Average Variance Extracted
	IAB15	0.849			
	IAB16	0.935			
	IAB17	0.920			
	IAB2	0.929			
	IAB4	0.938			
	IAB6	0.908			
	IAB7	0.896			
	IAB8	0.919			
	IAB9	0.803			
Learning Outcomes	LO1	0.939	0.946	0.957	0.760
	LO2	0.909			
	LO3	0.809			
	LO4	0.775			
	LO5	0.807			
	LO6	0.930			
	LO7	0.916			

As shown in Table 3, discriminant validity was established using the Fornell–Larcker criterion, confirming that each construct is empirically distinct. The square root of the AVE for each construct—ICT Accessibility (0.824), ITC Attitude and Beliefs (0.905), and Learning Outcomes (0.872)—was greater than its correlations with other constructs, thereby satisfying the standard set by Fornell & Larcker (1981). These findings affirm the discriminant validity and robustness of the measurement model (Hair et al., 2017), indicating that the constructs reliably measure unique aspects of the underlying theoretical framework.

Table 3 Latent Variable Correlations (Fornel-Larcker Criterion)

Constructs	IA	IAB	LO
ICT Accessibility (IA)	0.824		
ICT Attitude & Belief (IAB)	0.300	0.905	
Learning Outcomes (LO)	0.403	0.299	0.872

Table 4, discriminant validity was further supported using the Heterotrait-Monotrait Ratio (HTMT), with all values below the 0.90 threshold (Henseler et al., 2016). Specifically, the values for IA–IAB (0.309), IA–LO (0.418), and IAB–LO (0.308) demonstrate a clear separation between the constructs, thereby confirming robust discriminant validity within the measurement model.

Table 4 Discriminant Validity (Heterotrait-Monotrait Ratio - HTMT)

Constructs	IA	IAB	LO
ICT Accessibility (IA)			
ICT Attitude & Belief (IAB)	0.309		
Learning Outcomes (LO)	0.418	0.308	

➢ *Structural Model Evaluation*

After confirming the validity of the measurement model, the R^2 values were examined to determine how well the exogenous variables explain the endogenous constructs. Higher R^2 values reflect greater explanatory power. According to Chin (1998), R^2 values greater than 0.67 indicate a substantial level of explanatory power, values between 0.33 and 0.67 are considered moderate, those between 0.19 and 0.33 are seen as weak, and R^2 values below 0.19 are deemed unsatisfactory. Table 5 presents the structural model indicators. The results show that the construct Learning Outcomes has an R-square value of 0.198 and an adjusted R-square of 0.193. This means that approximately 19.8% of the variance in Learning Outcomes is explained by the predictors in the model, and after adjusting for the number of predictors, 19.3% of the variance remains explained. From a research perspective, particularly in the social sciences, this reflects a weak to moderate explanatory power. While not high, it is still meaningful—especially if the construct of Learning Outcomes is influenced by a wide range of external and internal factors. The small drop between R^2 and adjusted R^2 also suggests that the model is not overfitted and the predictors contribute meaningfully.

Table 5 Coefficient of Determination (R Square)

Constructs	R-square	R-square adjusted
Learning Outcomes	0.198	0.193

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

Moreover, the f^2 effect sizes were calculated to determine the contribution of each predictor to the variance explained in learning outcomes, using Cohen (1988) thresholds of 0.02, 0.15, and 0.35 for small, medium, and large effects, respectively. As shown in Table 6, both ICT Accessibility and ICT Attitude & Belief demonstrated small effect sizes. ICT Accessibility had an effect size of 0.135, indicating a limited but noticeable influence on student achievement. ICT Attitude & Belief showed an even smaller effect size of 0.043, suggesting a minimal direct impact on learning outcomes. These results imply that while ICT factors are relevant, they alone do not strongly predict academic success. Therefore, broader strategies—such as enhancing pedagogy, curriculum design, and teacher digital competence—are necessary to meaningfully improve learning outcomes.

Table 6 Effect Sizes (f^2) Analaysis

Learning Outcomes	Effect Size	Decisions
ICT Accessibility	0.135	Small
ICT Attitudes & Beliefs	0.043	Small

Furthermore, Q^2 values were derived using the blindfolding procedure to evaluate the model's predictive relevance; values greater than zero suggest that the model has sufficient predictive accuracy Henseler & Sarstedt (2013). The construct Learning Outcomes shows a Sum of Squared Errors (SSE) of 2,282.000 and a Sum of Squares Total (SSO) of 1,950.828, resulting in a 1 – SSE/SSO value of 0.145. This value represents the explained variance, equivalent to an R^2 of 0.145, or 14.5%. This indicates that only 14.5% of the variance in Learning Outcomes is explained by the predictors in the model, which reflects a weak explanatory power. In the context of educational research, this suggests that while the model captures some relevant factors, a large portion of variance remains unexplained. Additional variables—such as teaching quality, student motivation, or institutional factors—may need to be included to improve the model's explanatory strength in *Table 7*.

Table 7 Construct Cross Validated Redundancy (Q2)

Constructs	SSE	SSO	1-SSE/SSO
Learning Outcomes	2,282.000	1,950.828	0.145

- Note: SSO - Systematic Sources of Output; SSE - Systematic Sources of Error

Thus, in table 8, SRMR values for both the saturated model and the estimated model are both 0.069 below the recommended threshold of 0.10 it can be concluded that the model used in this study has a good fit (Henseler et al., 2014b; Hu & Bentler, 1999).

Table 8 Goodness of Fit of The Model

Item	Saturated Model	Estimated Model
SRMR	0.069	0.069
d_ULS	2.823	2.823
d_G	8.326	8.326
Chi-Square	8,473.182	8,473.182
NFI	0.599	0.599

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

➢ *Hypothesis Testing*

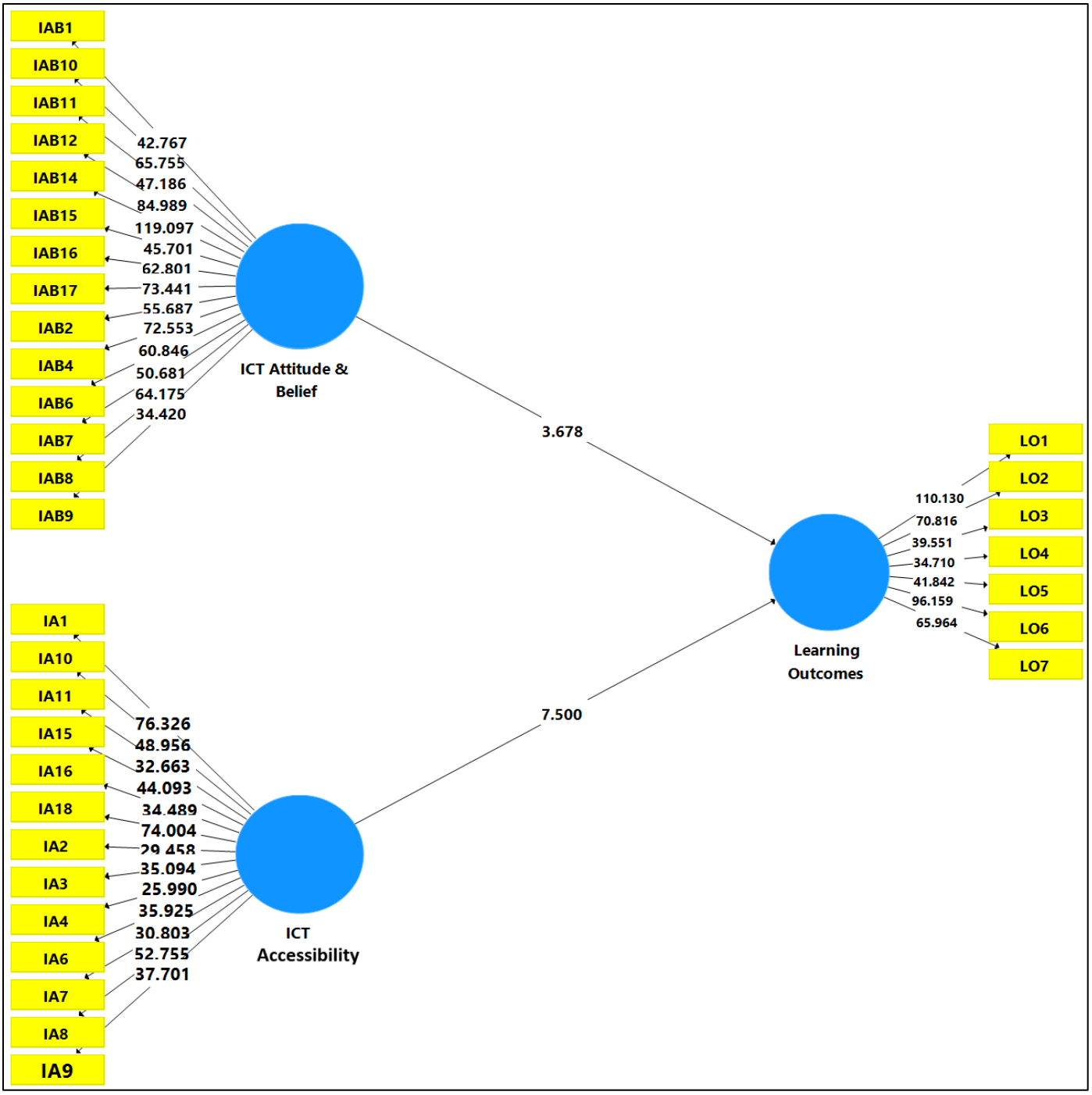

Fig 2 Path Model Significant

Table 9 shows the results reveal a statistically significant and positive relationship between ICT attitude and beliefs and learning outcomes in Cambodian public higher education institutions (β = 0.197, SE = 0.053, t = 3.678, p = 0.000). This suggests that students' positive attitudes and beliefs towards ICT significantly contribute to enhanced educational outcomes. These findings are consistent with prior studies which underscore the role of ICT-related attitudes in shaping effective learning behaviors and academic achievement. For instance, Latorre-Cosculluela et al. (2023) demonstrated that students' confidence in ICT, paired with proactive engagement in technology-enhanced learning environments, positively affects their academic performance and active classroom behavior. Similarly, Al-Rahmi et al. (2022) emphasized that the acceptance and positive perception of mobile technologies and m-learning platforms are critical determinants of students' motivation and success in higher education contexts. Together, these findings reinforce the notion that cultivating a constructive attitude towards ICT use is fundamental in fostering meaningful learning outcomes within digital and blended

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep239

learning environments, particularly in emerging educational contexts like Cambodia.

The findings indicate a strong, statistically significant positive relationship between ICT accessibility and learning outcomes within Cambodian public higher education institutions ($\beta = 0.345$, SE = 0.046, t = 7.500, p = 0.000). This suggests that greater access to ICT resources substantially enhances students' academic performance and overall learning experiences. These results align with existing research that emphasizes the foundational role of digital access in shaping educational equity and effectiveness. For example, Okoye et al. (2023) highlighted that in Latin American higher education, improved access to digital technologies directly correlates with better pedagogical outcomes, while limitations in infrastructure and connectivity often hinder student engagement and learning. Similarly, Kulal et al. (2024) stressed that equitable digital access is critical for fostering inclusive and high-quality education, particularly in remote and underserved regions. Their study underscores that ICT accessibility serves as a catalyst not only for academic achievement but also for reducing disparities in digital learning environments. In the Cambodian context, where digital infrastructure remains uneven, these findings reinforce the need for systemic efforts to expand ICT access as a means of enhancing learning outcomes and educational equity.

Table 9 Direct Effect Hypotheses Testing

Hypothesis	Coef.	Se	T value	P values	Decision
ICT Attitude & Belief -> Learning Outcomes	0.197	0.053	3.678	0.000	Supported
ICT Accessibility -> Learning Outcomes	0.345	0.046	7.500	0.000	Supported

- Note: Coef. = Coefficient; se = standard error.

V. CONCLUSION

This study confirms that both ICT accessibility and ICT attitudes and beliefs have a statistically significant but modest impact on learning outcomes in Cambodian public higher education. While the measurement model showed strong reliability and validity, the structural model revealed limited explanatory power ($R^2 = 0.198$). These findings suggest that although ICT factors are important, they alone are insufficient to drive significant improvements in learning outcomes. Broader educational strategies such as enhancing pedagogy, curriculum design, and institutional support are needed to achieve more substantial progress.

This study examined the impact of ICT-related factors like attitudes and beliefs (H1) and accessibility (H2) on learning outcomes in Cambodian public higher education institutions. The results revealed that both ICT attitudes and beliefs and accessibility have a statistically significant and positive influence on student learning outcomes. Specifically, ICT accessibility demonstrated a stronger effect, highlighting the critical role of infrastructure and digital inclusion in supporting academic success. Meanwhile, students' positive attitudes and beliefs towards ICT were also found to significantly enhance learning engagement and performance. These findings underscore the need for a holistic approach that combines investment in ICT infrastructure with efforts to cultivate positive digital mindsets. For developing educational systems in countries like Cambodia, such strategies are essential for leveraging technology to improve learning outcomes and reduce digital inequities in higher education.

This study is limited by its cross-sectional design, which prevents causal inference, and reliance on self-reported data, which may be subject to bias. Additionally, the focus on public institutions in Cambodia limits generalizability. Future research should consider longitudinal designs, include objective performance data, and explore other variables such as digital literacy, teacher support, and institutional infrastructure. Expanding the study to include private institutions and cross-country comparisons could provide broader insights into the role of ICT in higher education.

REFERENCES

[1]. Alhassan, M. D., & Adam, I. O. (2021). The effects of digital inclusion and ICT access on the quality of life: A global perspective. Elsevier, 64, 1–7. https://doi.org/10.1016/j.techsoc.2020.101511

[2]. Al-Rahmi, A. M., Al-Rahmi, W. M., Alturki, U., Aldraiweesh, A., Almutairy, S., & Al-Adwan, A. S. (2022). Acceptance of mobile technologies and M-learning by university students: An empirical investigation in higher education. Springer, 27(6), 7805–7826. https://doi.org/10.1007/S10639-022-10934-8

[3]. Alzahrani, L. (2023). Analyzing students' attitudes and behavior toward artificial intelligence technologies in higher education. Researchgate.Net, 11(6), 2277–3878. https://doi.org/10.35940/ijrte.F7475.0311623

[4]. Bandura, A. (1997). Self-efficacy: The exercise of control. Freeman.

[5]. Banerjee, A., & Chaudhury, S. (2010). Statistics without tears: Populations and samples. Industrial Psychiatry Journal, 19(1). https://doi.org/10.4103/0972-6748.77642

[6]. Bryman, A. (2016). Social research methods (pp. 1–15).

[7]. Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In Modern methods for business research (Issue 2, pp. 295–336).

[8]. Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences Second Edition (2nd ed.). LAWRENCE ERLBAUM ASSOCIATES.

[9]. Creswell, J., & Creswell, J. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications, Inc.

https://www.ucg.ac.me/skladiste/blog_609332/objava_105202/fajlovi/Creswell.pdf

[10]. Fernández-Gutiérrez, M., Gimenez, G., & Calero, J. (2020). Is the use of ICT in education leading to higher student outcomes? Analysis from the Spanish Autonomous Communities. Elsevier, 157. https://doi.org/10.1016/j.compedu.2020.103969

[11]. Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18(3), 382. https://doi.org/10.2307/3150980

[12]. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, Marko. (2017). A primer on partial least squares structural equation modeling (PLS-SEM). Sage.

[13]. Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Ketchen, D. J., Hair, J. F., Hult, G. T. M., & Calantone, R. J. (2014a). Common beliefs and reality about partial least squares: comments on Rönkkö and Evermann. Organizational Research Methods, 17(2), 182–209. https://doi.org/10.1177/1094428114526928

[14]. Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Ketchen, D. J., Hair, J. F., Hult, G. T. M., & Calantone, R. J. (2014b). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). Organizational Research Methods, 17(2), 182–209. https://doi.org/10.1177/1094428114526928

[15]. Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. International Marketing Review, 33(3), 405–431. https://doi.org/10.1108/IMR-09-2014-0304/FULL/HTML

[16]. Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. Springer, 28, 565–580. https://doi.org/10.1007/S00180-+012-0317-1

[17]. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1–55. https://doi.org/10.1080/10705519909540118

[18]. Iwadi, I. M., Ali, D. A., & Jabari, M. (2024). Artificial Intelligence Techniques and Their Role in Enhancing the Competitive Advantage of Palestinian Schools. Palestine Ahliya University Journal for Research and Studies, 03(2), 120–135.

[19]. Jing, T., & Ali, D. A. (2024a). Exploring The Relationship Between Faculty Engagement And Institutional Performance: A Case Study Approach In Jiangxi's Universities. Sciences of Conservation and Archaeology, 36(3), 486–491. https://doi.org/10.48141/sci-arch-37.2.24.56

[20]. Jing, T., & Ali, D. A. (2024b). THE INFLUENCE OF CRM AND ORGANIZATIONAL AGILITY ON CAREER OUTCOMES: A STUDY IN JIANGXI HIGHER EDUCATION INSTITUTIONS. Globus Journal of Progressive Education, 14(1). https://doi.org/10.46360/globus.edu.220241018

[21]. Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. Educational and Psychological Measurement, 30(3), 607–610. https://doi.org/10.1177/001316447003000308

[22]. Kulal, A., Dinesh, S., Abhishek, N., & Anchan, A. (2024). Digital access and learning outcomes: a study of equity and inclusivity in distance education. International Journal of Educational Management, 38(5), 1391–1423. https://doi.org/10.1108/IJEM-03-2024-0166/FULL/HTML

[23]. Latorre-Cosculluela, C., Sierra-Sánchez, V., Rivera-Torres, P., & Liesa-Orús, M. (2023). ICT efficacy and response to different needs in university classrooms: effects on attitudes and active behaviour towards technology. Journal of Computing in Higher Education, 36(2), 350–367. https://doi.org/10.1007/s12528-023-09357-2

[24]. Nunnally, J. C. (1978). An overview of psychological measurement. Springer, 97–146. https://doi.org/10.1007/978-1-4684-2490-4_4

[25]. Okoye, K., Hussein, H., Arrona-Palacios, A., Quintero, H. N., Ortega, L. O. P., Sanchez, A. L., Ortiz, E. A., Escamilla, J., & Hosseini, S. (2023). Impact of digital technologies upon teaching and learning in higher education in Latin America: an outlook on the reach, barriers, and bottlenecks. Education and Information Technologies, 28, 2291–2360. https://doi.org/10.1007/s10639-022-11214-1

[26]. Pan, L., Haq, S. ul, Shi, X., & Nadeem, M. (2024). The impact of digital competence and personal innovativeness on the learning behavior of students: exploring the moderating role of digitalization in higher education. Journals.Sagepub.Com, 14(3), 1–19. https://doi.org/10.1177/21582440241265919

[27]. Peng, Z., & Ali, D. (2025). LEADERSHIP AND CAREER PLANNING IN HIGHER EDUCATION: A CRITICAL REVIEW OF THEIR IMPACT ON STUDENT SUCCESS. An International Journal of Management, 14(2), 32. https://doi.org/10.46360/cosmos.mgt.420251007

[28]. Saks, K. (2024). The effect of self-efficacy and self-set grade goals on academic outcomes. Front. Psychol., 1–11. https://doi.org/10.3389/fpsyg.2024.1324007

[29]. Su, X., & Ali, D. A. (2024). Education Level and Experience Moderates the Effects of Gender Discrimination on Employee Compensation at Taizhou Universities. Frontiers in Health Informatics, 13(8), 3501.

[30]. Yang, Y. (2023). Impact of organizational support on students' information and communication technology self-efficacy, engagement, and satisfaction in a blended learning. Journals.Sagepub.Com, 13(4). https://doi.org/10.1177/21582440231216527