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Examining the Influence of ICT Skills on the Educational Achievement of Students in Cambodian Public Higher Education

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Abstract: The integration of Information and Communication Technology (ICT) has become a critical driver in enhancing teaching, learning, and institutional effectiveness in higher education. The government of Cambodia and universities have made significant strides in adopting ICT, yet challenges remain in ensuring equitable access, digital literacy, and effective pedagogical use of technology. This study investigates the influence of ICT skills on students' educational achievement in Cambodian public higher education institutions. A quantitative research design was employed, with data collected through a structured questionnaire distributed to students across three public universities. Out of 384 questionnaires distributed, 326 valid responses were analyzed using exploratory factor analysis, reliability testing, and regression analysis. The findings reveal that ICT skills significantly and positively influence students' educational achievement, explaining 20.4% of the variance in outcomes. Students with higher ICT skills demonstrate stronger engagement with academic resources, problem-solving capacity, and overall performance. These results align with global research emphasizing the importance of ICT in bridging learning gaps and preparing students for digitalized academic and professional environments. The study underscores the need for higher education institutions to integrate ICT training into curricula and provide supportive infrastructures to enhance digital competencies. The implications extend to policymakers and educators, highlighting that fostering ICT proficiency is essential not only for academic success but also for preparing graduates to meet the demands of an increasingly knowledge-driven economy.

Keywords: *Educational Achievement, ICT Skills, Digital Transformation, Student Engagement, Cambodian Higher Education.*

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I. INTRODUCTION

The rapid advancement of Information and Communication Technology (ICT) has fundamentally reshaped the educational sector worldwide, transforming the ways in which teaching, learning, and institutional operations are conducted. Higher education has witnessed a profound impact, as digital tools and online platforms increasingly complement or replace traditional methods of course delivery. This digital transition is not only altering the pedagogy of learning but also influencing students' academic experiences and outcomes. In many countries, ICT integration is regarded as a cornerstone of modern education systems, with the potential to enhance accessibility, efficiency, and innovation in teaching and learning practices. In emerging educational systems such as Cambodia, the adoption of ICT has been especially significant. With strong governmental support and strategic investments in digital infrastructure, universities have sought to integrate ICT into their curricula and administrative processes to expand educational access and improve quality. Yet, despite notable progress, the Cambodian higher education sector continues to face challenges in fully leveraging technology for academic advancement. These challenges include disparities in digital literacy among students, uneven distribution of technological resources, and institutional constraints in designing ICT-

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supported pedagogical strategies. Consequently, while the integration of ICT is often assumed to directly enhance educational achievement, the underlying mechanisms through which this occurs remain underexplored in the Cambodian context. A critical determinant in this relationship is ICT skill, which refers to the ability of students to effectively utilize digital tools for academic purposes. ICT skill encompasses skills such as navigating learning management systems, using productivity software, conducting online research, and engaging with digital collaboration platforms. Students who possess strong ICT competencies are more likely to take advantage of the learning opportunities afforded by technology, thereby improving their academic performance. Conversely, students with limited digital skills may struggle to adapt to technology-driven learning environments, leaving them at a disadvantage in achieving desired academic outcomes.

However, the link between ICT skill and educational achievement cannot be understood solely in terms of technical proficiency. Psychological factors, particularly self-efficacy, play a pivotal role in shaping how students engage with ICT. Drawing on Bandura (1997) social cognitive theory, self-efficacy refers to individuals' beliefs in their ability to organize and execute actions required to achieve specific tasks. In the context of ICT and education, self-efficacy reflects students' confidence in their capacity to use digital tools to support their academic work. High levels of ICT self-efficacy encourage learners to explore technology, adopt innovative learning strategies, and persist through challenges, which in turn lead to improved academic outcomes. On the other hand, students with low self-efficacy may avoid or underutilize ICT resources, thereby limiting their learning potential even if adequate infrastructure and tools are available. These dynamic positions self-efficacy as a mediating mechanism between ICT skill and educational achievement. While ICT skill provides the technical foundation, self-efficacy determines the extent to which these competencies are effectively applied in academic contexts. For example, two students with similar levels of ICT skill may exhibit different academic results depending on their levels of self-efficacy. The one with higher self-efficacy is more likely to actively engage with online resources, collaborate digitally with peers, and develop problem-solving strategies, while the other may disengage or experience anxiety in digital learning environments. Therefore, understanding self-efficacy as a mediating construct is essential for comprehensively assessing how ICT competencies translate into tangible academic achievements.

In Cambodia, where higher education institutions are striving to align with global standards of digital learning, examining this interplay becomes particularly relevant. The country's rapid yet uneven integration of ICT highlights the importance of investigating not only infrastructural readiness but also students' psychological preparedness to thrive in technology-enhanced learning environments. Although international literature increasingly acknowledges the significance of self-efficacy in technology-supported learning, empirical studies in the Cambodian higher education context remain limited. Most existing research emphasizes infrastructural barriers or general ICT adoption, leaving a gap in understanding the nuanced psychological factors that condition the relationship between ICT skill and educational achievement. Addressing this gap, the present study examines the relationship between ICT skills and educational achievement among Cambodian university students. It specifically investigates how proficiency in digital technologies contributes to students' academic performance. By concentrating on the technical dimensions of ICT integration, this research provides a clearer understanding of how digital competencies directly influence learning success. The findings are expected to generate valuable insights for educators, policymakers, and institutions in developing strategies that strengthen students' ICT capabilities and ensure their effective use in academic settings. Furthermore, the study highlights the broader significance of ICT adoption in emerging education systems, offering lessons relevant not only to Cambodia but also to other developing contexts undergoing digital transformation.

II. LITERATURE REVIEW

Information and Communication Technology (ICT) has emerged as a transformative driver in contemporary education, offering new opportunities to enrich teaching, enhance learning experiences, and strengthen institutional effectiveness. Within this digital shift, ICT competency is increasingly recognized as a crucial factor influencing both student learning and overall educational quality. More than just access to technological tools, ICT skill refers to the ability to locate, evaluate, and apply digital information effectively in academic settings. According to Chege et al. (2020), ICT encompasses a wide range of technologies, including hardware, software, networking systems, and digital content, all designed to facilitate the acquisition, storage, processing, and communication of information. Mastery of these resources enables learners to fully participate in dynamic, interactive, and self-directed learning environments. Student engagement commonly described through cognitive, emotional, and behavioral involvement in academic tasks is strongly shaped by students' ICT proficiency. Learners who can confidently use digital resources are more likely to take an active role in the learning process by collaborating with peers, solving problems, and managing academic responsibilities independently. This active engagement does not merely improve classroom participation but also supports deeper comprehension, skill development, and persistence in higher education. As Sivakova et al. (2017) point out, integrating ICT into educational practices enhances not only the learning experience but also contributes to the broader effectiveness and reputation of academic institutions. Consequently, enhancing ICT competency has emerged as a key priority for higher education systems across the globe. In an era of rapid technological advancement, equipping students with relevant digital skills is no longer optional but a fundamental requirement. Building such competencies fosters engaged learners, improves educational quality, and ultimately promotes more equitable and impactful learning outcomes across diverse academic contexts.

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Educational achievement plays a central role in shaping and evaluating educational programs, as they clearly articulate the knowledge, skills, and values that learners are expected to achieve by the completion of a course or program. Unlike broad educational objectives, learning outcomes provide precise and measurable standards that guide both teaching practices and assessment processes. According to Yusop et al. (2022), these outcomes encompass the cognitive, affective, and psychomotor domains, highlighting not only intellectual understanding but also practical application and the development of appropriate attitudes. Expressed in observable and assessable terms, they serve as a shared framework that aligns the expectations of educators and students, ensuring clarity in the teaching and learning process. Iwano & Tsuda (2024) emphasize the strategic role of learning outcomes by likening them to a GPS system in education, directing curriculum development and supporting student progression. By explicitly defining the intended results of instruction, learning outcomes assist educators in identifying relevant course content, adopting effective pedagogical approaches, and selecting suitable assessment tools. For learners, they provide a transparent roadmap that encourages responsibility and independence in their educational journey. At the programmatic level, educational achievement enhance coherence across courses, enabling institutions to create structured curricula that reflect academic goals and societal demands. They also provide benchmarks for evaluating instructional quality, aligning higher education programs with industry standards, and ensuring that graduates are equipped with meaningful competencies. By guiding instructional design, fostering student engagement, and serving as measurable indicators of success, learning outcomes strengthen the integrity and impact of higher education.

The incorporation of Information and Communication Technology (ICT) in education has become a fundamental driver for enhancing teaching practices and improving student academic achievement in the modern era. At the core of this transformation is educators' ICT skill, which significantly affects their ability to deliver content effectively while fostering student engagement and academic success. Instructors with strong ICT skills are better equipped to integrate digital tools innovatively into classroom instruction, creating interactive, learner-centered environments. ICT skill extends beyond technical proficiency to include pedagogical knowledge of how technology can align with curriculum objectives and support differentiated instruction and assessment. Nevertheless, differences in instructors' ICT skills were shaped by factors such as age, gender, and access to professional development that can impede equitable adoption of technology in education. Effective ICT integration requires not only technical expertise but also institutional support, ongoing training, and confidence in using digital tools. Professional development programs that combine technological literacy with strategies for pedagogical application are crucial for sustaining meaningful ICT use. Without such support, digital initiatives risk remaining underutilized, limiting their impact on student learning. Moreover, integrating ICT has the potential to reduce digital disparities and enhance student motivation by offering innovative approaches that extend beyond conventional teaching methods. Ultimately, instructor ICT skill plays a decisive role in ensuring that digital tools function as instruments for quality education rather than supplementary resources. Therefore, investing in comprehensive educator training and institutional support is essential for maximizing learning outcomes in technology-enhanced educational environments (Ghavifekr & Rosdy, 2015; Liesa-Orús et al., 2020).

III. RESEARCH METHODOLOGY

➢ *Research Design*

The research design refers to the framework suitable for the research, depending on its nature or the problems involved. The research design should support and strengthen the research activities and actions (Davidavičienė, 2018), as well as presenting the structure of the methods of collecting and analysing the data in order to fulfil the study's objective (Azungah, 2018). Moreover, the population of study is defined as a group of elements sharing the same affinity or sentiment (Banerjee & Chaudhury, 2010). Consequently, the present research focuses on lecturers from selected public universities in Cambodia. These public universities were chosen for this study for several key reasons. Furthermore, as highlighted by Additionally, Krejcie & Morgan (1970) observed that the growing need for research has spurred efforts to identify an effective approach for determining the sample size necessary to accurately represent the population being studied.

➢ *Population and Sampling*

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. Therefore, the overall response rate was 84.9%, which is considered acceptable for quantitative analysis.

➢ *Instrumentation*

The five-point Likert scale, ranging from 1 – 5 (strongly disagree – strongly agree), was used to evaluate the main constructs in the study. The questionnaire was divided into four sections. Items addressing ICT skills context, drawing on established frameworks. And Educational Achievement was assessed using multiple dimensions based on prior educational research.

The questionnaire was meticulously developed using validated items corresponding to the study's key constructs. A pilot study was conducted to evaluate the instrument's internal consistency and reliability. The results revealed that Cronbach's alpha coefficients for the majority of the

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constructs ranged from 0.713 to 0.900, thereby exceeding the commonly accepted threshold of 0.70 (Nunnally, 1978).

➢ *Validity and Reliability*

To establish the construct validity of the measurement instruments, an Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) with Varimax rotation. This procedure was applied to both the ICT Skills and Educational Achievement constructs. The suitability of the dataset for factor analysis was confirmed through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity. In line with established methodological guidelines, only items with factor loadings of 0.50 or higher were retained (Hair et al., 2019). The internal consistency reliability of the scales was further examined using Cronbach's alpha coefficients. Both constructs demonstrated alpha values exceeding the recommended minimum threshold of 0.70, thereby indicating acceptable to high levels of reliability (Nunnally, 1978).

➢ *Data Analysis*

The data analysis was conducted by using IBM SPSS Statistics (Version 26). The procedure began with descriptive statistical analyses, including frequencies, means, and standard deviations, to summarize the demographic characteristics of the participants and examine the distributional properties of the survey responses. Subsequently, validated constructs were operationalized by computing composite scores, derived from the mean values of the retained items under each dimension. To test the primary hypothesis concerning the influence of autocratic leadership style on students' performance, a simple linear regression analysis was employed. Statistical significance was assessed at the 0.05 level, with model adequacy evaluated through the coefficient of determination (R^2) and standardized regression coefficients. This analytical strategy provided a rigorous basis for empirically testing the hypothesized relationship while ensuring the robustness of measurement integrity.

IV. ANALYSIS AND FINDINGS

A. *Respondents' Profile*

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***	

Table 1, the demographic profile of the respondents (N = 326) reveals a balanced gender distribution, with 47.5% male (n = 155) and 52.5% female (n = 171). This balance indicates that the findings are not likely to be strongly biased by gender representation.

In terms of age composition, the majority of students were within the typical undergraduate range: 33.4% were younger than 20 years, and 37.1% were between 20 and 22 years. A further 26.4% were aged 23–25 years, while only 3.1% were above 25 years. This distribution suggests that the sample largely reflects traditional-age university students, with only a small proportion of mature or postgraduate learners.

Regarding institutional representation, the majority were enrolled at the Royal University of Phnom Penh (RUPP) (60.4%), followed by the National University of Management (NUM) (29.4%) and the National University of Battambang (NUBB) (10.1%). The heavy concentration of RUPP students should be acknowledged, as it may constrain the broader applicability of the results across institutions.

B. *Factor Analysis (EFA) for ICT Skills*

Table 2: Component Matrix for ICT Skills (IS)

Item Code	***Component 1***	***Component 2***	***Component 3***
IS1	0.926		
IS2	0.897		
IS3	0.891		
IS4	0.939		

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Item Code	*Component 1*	*Component 2*	*Component 3*
IS5	0.934		
IS6			0.831
IS7			0.887
IS8	0.830		
IS9		0.816	
IS10		0.790	
IS11		0.846	
IS12		0.837	
IS13	0.949		
IS14	0.947		
IS15	0.944		
IS16	0.936		
IS17	0.699		
IS18	0.693		
IS19	0.913		

Table 3: KMO and Bartlett's Test of Sphericity

Measurement	*Value*
Kaiser-Meyer-Olkin (KMO)	0.854
Bartlett's Test of Sphericity	9,552.295
Df	171
Significance (p-value)	0.000

Table 2, an exploratory factor analysis was conducted on 19 items measuring ICT skills, revealing a three-component structure. Component 1 represents general ICT proficiency, including items such as IS1–IS5, IS8, and IS13–IS16, with high loadings ranging from 0.891 to 0.949, indicating strong measurement of foundational digital skills. Component 2 reflects advanced or applied ICT skills (IS9–IS12), with loadings between 0.790 and 0.846, suggesting these items capture practical and specialized ICT capabilities. Component 3 comprises emerging ICT competencies (IS6, IS7, IS17–IS19) with moderate to high loadings (0.693–0.913), representing integrative and problem-solving skills using technology. Overall, the strong loadings across items support the construct validity of the ICT skills scale and demonstrate that ICT competence in higher education is multi-dimensional, encompassing foundational, applied, and emerging skills.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.854, indicating that the sample is highly suitable for factor analysis. Bartlett's Test of Sphericity was significant (χ^2 = 9,552.295, df = 171, p = 0.000), confirming that the correlation matrix is not an identity matrix and that the items are sufficiently correlated for factor extraction. Together, these results demonstrate that the data meet the assumptions for conducting exploratory factor analysis (EFA) as shown in Table 3.

C. Factor Analysis (EFA) for Educational Achievement

Table 4: Component Matrix for Educational Achievement (EA)

Item Code	*Component 1*
EA1	0.949
EA2	0.917
EA3	0.791
EA4	0.762
EA5	0.797
EA6	0.939
EA7	0.927

Table 5: KMO and Bartlett's Test of Sphericity

Measurement	**Value**
Kaiser-Meyer-Olkin (KMO)	0.898
Bartlett's Test of Sphericity	2,772.550
df	21
Significance (p-value)	0.000

Table 4, the exploratory factor analysis (EFA) of seven items measuring Educational Achievement revealed a single-component structure. All items loaded strongly on Component 1, with factor loadings ranging from 0.762 to 0.949, indicating that the items

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consistently measure the same underlying construct of educational achievement. High loadings (>0.70 for most items) suggest strong internal consistency and support the construct validity of the measurement scale.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.898, indicating that the data are highly suitable for factor analysis. Bartlett's Test of Sphericity was also statistically significant ($\chi^2 = 2{,}772.550$, df = 21, p = 0.000), confirming that the inter-item correlations were sufficiently strong to warrant the application of exploratory factor analysis (EFA). Collectively, these results indicate that the dataset satisfies the necessary assumptions for robust factor extraction, as presented in Table 5.

D. Reliability Analysis (Cronbach's Alpha)

Table 6: Reliability Analysis Using Cronbach's Alpha

Construct	No. of Items	Cronbach's Alpha
Demographic	3	0.713
ICT Skills	19	0.953
Educational Achievement	7	0.945

Table 6 reports the results of the reliability analysis using Cronbach's Alpha. The Demographic scale achieved acceptable reliability ($\alpha = 0.713$), reflecting consistent measurement across its three items. The ICT Skills scale demonstrated excellent reliability ($\alpha = 0.953$), indicating that the 19 items reliably represent the construct of ICT competence. Likewise, the Educational Achievement scale showed excellent internal consistency ($\alpha = 0.945$) across its seven items. All values exceed the recommended threshold of 0.70 (Nunnally, 1978), confirming that the instruments are reliable and suitable for further statistical analysis.

E. Hypotheses Tested

H1: ICT skills have a positive and significant influence on students' educational achievement in Cambodian public higher education institutions.

Table 7: Simple Linear Regression

Variables	Unstandardized Coefficient (B)	Standard Error	t-value	Sig.
Constant	1.683	0.204	8.232	0.000
ICT Skills	0.514	0.056	9.116	0.000
R = 0.452				
R Square = 0.204				
Adjust R Square = 0.202				
F = 83.107				

A simple linear regression was conducted to test H1, which states that ICT skills have a positive and significant influence on students' educational achievement in Cambodian public higher education institutions. Table 7, the analysis showed that ICT skills significantly predict educational achievement (B = 0.514, t = 9.116, p = 0.000). This positive coefficient indicates that an increase in ICT skills is associated with higher educational achievement, supporting the proposed hypothesis H1.

The model explains 20.4% of the variance in students' educational achievement ($R^2 = 0.204$), with an F-value of 83.107 (p = 0.000), confirming that the regression model is statistically significant. These findings are consistent with prior research, which highlights the role of ICT in enhancing academic outcomes. For instance, (Liang et al., 2025) found a global positive relationship between ICT usage and academic performance using network analysis, while (Youssef et al., 2022) reported that digital skills positively influence students' performance, especially when bridging the digital divide.

Overall, the results provide empirical support that ICT skills are a key determinant of students' educational achievement, aligning with both the theoretical rationale and previous empirical studies in higher education contexts.

V. CONCLUSION, LIMITATION OF STUDY, AND FUTURE RESEARCH

This study confirms that ICT skills play a pivotal role in shaping educational achievement in Cambodian public higher education institutions. Students with stronger ICT proficiency are better equipped to navigate digital learning environments, access academic resources, and achieve higher performance levels. Beyond individual benefits, enhancing ICT skills contributes to the overall quality of education and supports national efforts toward digital transformation in higher education.

Several limitations should be acknowledged. First, the study was restricted to public universities, which may limit generalizability to private or international institutions. Second, the cross-sectional design prevents conclusions

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about long-term impacts of ICT skills on academic success. Third, reliance on self-reported data may have introduced response bias, potentially inflating perceptions of ICT competence and achievement.

Future studies should employ longitudinal designs to explore causal relationships between ICT skills and academic performance over time. Expanding research to include private universities and cross-country comparisons would enhance generalizability. Incorporating qualitative methods, such as classroom observations or interviews, could provide deeper insights into how ICT is integrated into daily learning practices. Additionally, examining mediating and moderating factors; such as teaching methods, institutional ICT infrastructure, or faculty support; would clarify the conditions under which ICT skills most effectively improve educational outcomes.

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