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The computer, information and communication technology, and communication skills of Thai Rajabhat University students

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ABSTRACT

The lack of comprehensive data on computer, information and communication technology (ICT), and communication skills among Thai Rajabhat University students poses a challenge in developing effective educational strategies that enhance student employability and future readiness. To address this gap, this study aimed to assess these skills and analyze the skill profiles of students from Rajabhat Universities across Thailand. A total of 1,165 students were selected through multi-stage sampling, and their skills were measured using a researcher-developed 5-point Likert scale questionnaire. The results showed high levels of self-reported skills, with communication skills being the highest (mean=3.84, SD=0.669), followed by ICT (mean=3.81, SD=0.676) and computer skills (mean=3.65, SD=0.628). Latent profile analysis (LPA) identified four potential models with 2, 3, 4, and 5 groups, with the four-group model offering the best fit (likelihood=-1887.336, Akaike information criterion (AIC)=3810.673, Bayesian information criterion (BIC)=3901.762, Akaike's Bayesian information criterion (ABIC)=3844.587, entropy=0.940). These findings provided critical insights for curriculum development and tailored interventions, supporting universities in meeting diverse student needs and improving educational outcomes.

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1. INTRODUCTION

In the rapidly evolving world driven by advancements across social, political, economic, and technological domains under the influence of globalization, 21st-century education faces the critical challenge of preparing learners for modern life. To succeed in today's society, university students must be equipped with essential skills, such as lifelong self-development and effective use of technology for self-directed learning [1]. While digital skills are important, 21st-century skills are broader and encompass more than just information and communication technology (ICT) [2]. These include critical thinking, creativity, communication, collaboration, information management, and problem-solving, all necessary for effective participation in the global economy [3], [4].

Research on ICT skills among university students in low and middle-income countries shows significant disparities in digital competence. While some students possess advanced skills, many struggle with basic ICT usage [5], [6]. Additionally, these students face challenges in acquiring broader 21st-century skills such as critical thinking, problem-solving, creativity, innovation, collaboration, and communication.

For example, in Pakistan, universities find it difficult to develop these skills effectively for most students due to inadequate pedagogical approaches [7]. Similarly, studies in Ethiopia and Pakistan indicate that faculty lack the necessary teaching competencies to foster these critical skills [7], [8]. A study at Thai Rajabhat University also identifies challenges in curriculum design, teaching methodologies, and skill assessment, further complicating the development of these competencies [9].

In contrast, research from Spain suggests that professors see the potential of ICT tools to enhance 21st-century skills like communication, collaboration, and critical thinking; however, such recognition is not always matched with effective implementation [10]. Meanwhile, many students are eager to acquire skills that go beyond traditional education to meet future demands, but universities often fail to adequately prepare them [11], [12]. This mismatch between the emphasis on these skills and the actual training provided suggests that current educational frameworks are insufficient [13].

These studies underscore the urgent need for universities to reconfigure their educational frameworks to better support the development of both digital and broader 21st-century skills [11], [12]. To achieve this, universities must integrate these skills into their curricula, supported by appropriate standards, assessments, instructional strategies, professional development, and conducive learning environments [12], [14]. Equipping students with these skills is vital for their effective participation in a complex, knowledge-based global economy [3]. Given these challenges, it becomes essential to assess and improve students' ICT skills, which are crucial for effective learning and future employability. Research shows that there is considerable variability in information technology (IT) skills among university students, underscoring the need for targeted training and the identification of distinct skill profiles [5]. However, no large-scale study has yet examined these competencies across all Rajabhat Universities in Thailand, leaving a critical gap in understanding the specific needs of this student population.

To address this gap, the current study aims to investigate the self-perceived levels of computer, ICT, and communication skills among Thai Rajabhat University students. Also, it is to identify distinct profile groups based on these skills. Specifically, it seeks to answer:

i) What are the self-perceived computer, ICT, and communication skills among students at Thai Rajabhat Universities?

ii) Are there distinct profile groups among these students based on their self-perceived skills?

We hypothesize that Thai Rajabhat University students will demonstrate a range of self-perceived computer, ICT, and communication skills, forming distinct profile groups. Understanding these skill levels and profiles will enable this study to identify specific gaps in students' competencies, guiding curriculum development to provide targeted interventions that enhance their employability and readiness for the future. Furthermore, recognizing diverse student profiles will allow universities to design educational strategies that address varied learning needs, promote inclusive practices, and encourage innovation in teaching and learning. This research will ultimately help better prepare students for the challenges of a complex, knowledge-based global economy, while also providing valuable insights for policymakers and educators to make informed decisions on resource allocation and strategic planning to enhance educational quality.

2. METHOD

A cross-sectional design was used to assess these skills and analyze student profiles to address the need for comprehensive data on computer, ICT, and communication skills among Thai Rajabhat University students. This study was approved by the Ethics Committee of Chaiyaphum Rajabhat University, Thailand.

2.1. Sample

A multi-stage sampling approach was employed to select a representative sample of 1,165 students from Rajabhat Universities. The sampling process proceeded as:

- Regional sampling: Rajabhat Universities from four regions—Northeastern, Central, Northern, and Southern Thailand—were identified as the initial sampling units. Simple random sampling was conducted, resulting in the selection of two regions: Northeastern and Central.
- University selection: within these regions, universities were randomly selected. Six universities from the Northeastern Region (Chaiyaphum, Nakhon Ratchasima, Roi Et, Mahasarakham, Udon Thani, and Ubon Ratchathani Rajabhat Universities) and five universities from the Central Region (Nakhon Pathom, Kanchanaburi, Phetchaburi, and Muban Chombueng Rajabhat Universities) were chosen.
- Student sampling: a simple random sampling of students within each selected university was conducted, yielding a total of 1,165 participants. The sample distribution showing the number of students by university and study year is presented in Tables 1 and 2, respectively.

Table 1. Number of students by university

Rajabhat University	Number	Percentage (%)
Chaiyaphum	45	3.9
Nakhon Ratchasima	209	17.9
Roi Et	28	2.4
Mahasarakham	35	3.0
Ubon Ratchathani	168	14.4
Kanchanaburi	15	1.3
Petchaburi	52	4.5
Muban Chombueng	124	10.6
Nakhon Pathom	304	26.1
Udon Thani	185	15.9
Total	1,165	100

Table 2. Number of students by study year

Study year	Number	Percentage (%)
1st year	183	15.7
2nd year	495	42.5
3rd year	334	12.4
4th year	145	28.9
5th year	8	0.7
Total	1,165	100

2.2. Instrument

The researcher developed a questionnaire to assess students' computer, ICT, and communication skills. The questionnaire included 51 items, asking participants to rate their level of various skills and abilities on a 5-point Likert scale (1=lowest level of skills/ability and 5=highest level of skills/abilities). The computer skills were measured by 13 items asking about basic computer skills such as using programs and operating the computer. ICT skills were assessed by 18 items focusing on the ability to ethically use a variety of technology tools and to utilize the technology to benefit their learning and lives. Communication skills were measured by 20 items assessing media literacy skills and the ability to communicate effectively via different media and social media channels. The psychometric properties and structural validity of the questionnaire were reported in Siphai [15].

2.3. Data collection and procedure

Data collection was initiated by sending formal letters to the selected Rajabhat Universities, requesting permission to conduct the study and collect data from their students. Upon receiving approval, randomly selected students from each institution were contacted via email and invited to participate in the study. The invitation included a link to an online questionnaire designed to assess self-reported levels of computer, ICT, and communication skills. A total of 1,165 completed questionnaires were received, representing a 100% response rate from the selected sample.

2.4. Data analysis

2.4.1. Data screening

Prior to conducting latent profile analysis (LPA), the dataset underwent a series of preliminary tests to ensure it met the necessary assumptions for further analysis:

- Normality: the distribution of each variable was tested for normality using goodness-of-fit tests. In cases where the variables were not normally distributed, data transformations (e.g., square, logarithmic, and square root transformations) were applied to normalize the distribution, following the approach recommended by Hair *et al.* [16].
- Linearity and multicollinearity: the linear relationships between variables and potential multicollinearity were examined through Pearson's correlation coefficients. A threshold was set to ensure that independent variables had linear relationships with the dependent variable and did not exhibit excessive multicollinearity (r>80). Variables with excessively high correlations were either removed or combined to prevent redundancy in the analysis.

2.4.2. Descriptive statistics and latent profile analysis

Descriptive statistics and LPA were conducted using Mplus Version 7.4. Means and standard deviations were calculated to assess students' skill levels. The interpretation of mean scores followed established guidelines [17], as presented in Table 3. LPA was employed to identify distinct subgroups within

the student population based on their computer, ICT, and communication skills. LPA allows for the identification of homogeneous subgroups within a heterogeneous population using observed variables [18], [19]. The following procedures were undertaken:

i) Institution-based skill analysis: analysis of students' computer, ICT, and communication skills at the institutional level using specific indicators for each university.

ii) LPA of skills: classification of students into distinct profiles based on their skills, following these steps:

- Step 1: development of a profile analysis model based on questionnaire data.
- Step 2: specification and verification of the dataset.
- Step 3: parameter estimation for models with varying numbers of groups (2, 3, and 4), including: testing model fit against empirical data; estimating the probability of each student belonging to a specific group; analyzing patterns of skills within each group; calculating the mean probability of group membership; and evaluating group differences and determining sample sizes.
- Step 4: model comparison using Akaike information criterion (AIC), Bayesian information criterion (BIC), and Akaike's Bayesian information criterion (ABIC) indices to identify the best fit. The model with the lowest index values was selected.
- Step 5: presentation and interpretation of final results, highlighting the identified profiles and skill patterns.

Table 3. Interpretation of 5-point Likert scale mean scores

Mean score	Description
4.50-5.00	Has the highest level of proficiency
3.50-4.49	Has a high level of proficiency
2.50-3.49	Has a moderate level of proficiency
1.50-2.49	Has a low level of proficiency
1.00-1.49	Has the lowest level of proficiency

3. RESULTS AND DISCUSSION

3.1. Self-perceived computer, ICT, and communication skills

This study assessed the self-perceived computer, ICT, and communication skills of Rajabhat University students across Thailand. Overall, students reported high levels of proficiency across all three skill areas, with communication skills receiving the highest average score. Table 4 presents the detailed results.

Table 4. Mean scores and standard deviations of self-perceived skills

Skill area	Mean scores	Standard deviation	Description
Computer	3.65	0.628	High level of proficiency
ICT	3.81	0.676	High level of proficiency
Communication	3.84	0.699	High level of proficiency

3.2. Latent profile analysis

LPA was conducted using 51 indicators across three components: computer skills (13 indicators), ICT skills (18 indicators), and communication skills (20 indicators). LPA was employed to identify distinct subgroups among students based on their skill profiles. The analysis generated four potential models with 2, 3, 4, and 5 groups. After evaluating the model fit statistics, the four-group model was the best fit, as demonstrated by the following fit indices: log-likelihood=-1887.336, AIC=3810.673, BIC=3901.762, ABIC=3844.587, and entropy=0.940, as in Table 5. The 4-profile model, which categorized students into distinct groups, showed the following distribution: Group 1 (2.48%, n=29), Group 2 (33.30%, n=388), Group 3 (20.17%, n=235), and Group 4 (44.03%, n=513), as presented in Table 6.

The profiles significantly differentiated students based on their skill levels across the three components, with 94% prediction accuracy. Group characteristics by skill components are presented in Table 7. In Group 1, all skill components showed relatively low mean values, indicating that this group exhibited lower levels of self-perceived skills across all skill areas, with the lowest scores in ICT (mean=2.224, 44.48%). Group 2 displayed moderate levels of self-perceived proficiency, particularly in communication skills (mean=3.184, 63.68%), followed closely by ICT (mean=3.140, 62.80%) and computer skills (mean=3.128, 62.56%). Group 3 demonstrated the highest levels of self-perceived proficiency across all three skill areas, with communication skills having the highest mean (4.752, 95.04%), followed by ICT (4.733, 94.66%) and computer skills (4.401, 62.56%). In Group 4, students exhibited high proficiency levels, especially in ICT skills (mean=3.989, 79.78%) and communication skills (mean=3.983, 79.66%), while computer skills had a slightly lower mean (3.766, 75.32%).

Additional observations revealed that ICT skills consistently had higher mean scores than computer skills across all groups. Group 3 exhibited the highest average scores in all skill areas, particularly in communication skills, with a mean of 4.752 (95.04%). In contrast, Group 1 had the lowest average scores, especially in ICT skills, with a mean of 2.224 (44.48%). The mean distributions of computer, ICT, and communication skills across classes are presented in Figure 1.

Table 5. Latent profile fit statistics

No. of group	Log likelihood	No. of parameter	AIC	BIC	ABIC	Entropy	Group membership
2	-2603.594	10	5227.188	5277.792	5246.029	0.868	1=496
							2=669
3	-2098.596	14	4225.191	4296.038	4251.569	0.910	1=387
							2=242
							3=536
4	-1887.336	18	3810.673	3901.762	3844.587	0.940	1=29
							2=388
							3=235
							4=513
5	-1760.453	22	3564.906	3676.237	3606.358	0.907	1=26
							2=292
							3=415
							4=206
							5=226

Table 6. Distribution of students across classes

Class group	Group size	Proportion	Average probability
Class 1	29	0.025	0.980
Class 2	388	0.333	0.971
Class 3	235	0.202	0.955
Class 4	513	0.440	0.967

Table 7. Group characteristics by skill components

Skill components	Indicators	Class 1	Class 2	Class 3	Class 4
Component 1: computer	Mean	2.454**	3.128**	4.401**	3.766**
	S.D.	0.070	0.020	0.031	0.021
	Class (%)	49.08	62.56	88.02	75.32
Component 2: ICT	Mean	2.224**	3.140**	4.733**	3.989**
	S.D.	0.100	0.016	0.019	0.016
	Class (%)	44.48	62.80	94.66	79.78
Component 3: communication	Mean	2.330**	3.184**	4.752**	3.983**
	S.D.	0.092	0.018	0.021	0.016
	Class (%)	46.60	63.68	95.04	79.66

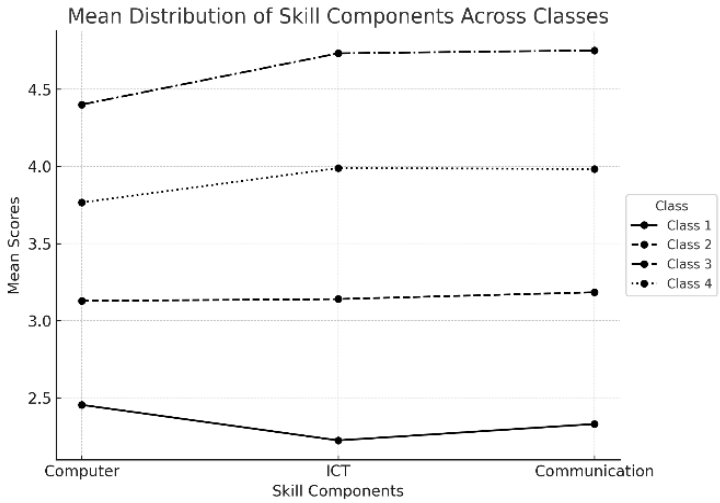

Figure 1. Mean distributions of skill components across classes

3.3. Discussion

The first research question examined Rajabhat University students' self-perceived computer, ICT, and communication skills. Overall, students reported high proficiency across all three areas, with communication skills rated the highest, followed by ICT and computer skills. The slightly lower ratings for computer skills may reflect students' greater familiarity with ICT platforms and communication tools, which are increasingly integrated into daily use, while traditional computer operations may receive less attention. This pattern aligns with findings in other developing countries, where students generally excel in basic ICT tasks but struggle with more advanced technical skills. For instance, students in Ghana and Bangladesh demonstrated competence in basic tasks but had difficulties with more complex software and web management [20], [21]. Similarly, students in Jordan used common technologies extensively for personal purposes, but their educational use remained limited [22]. These findings suggest a global trend in digital skill development, where access to technology does not always equate to comprehensive proficiency.

The second research question sought to identify distinct student profiles based on self-perceived skills. LPA revealed four distinct groups, offering a more comprehensive view of the student population beyond simple averages. Group 3 was characterized as the digital experts (20.17%) and demonstrated the highest proficiency across all skills, especially in communication and ICT. These students likely represent true "digital natives" who excel in technology-enhanced environments and could serve as peer mentors. Group 4, the confident majority, is the largest group, with 44.03%, and showed high proficiency, particularly in ICT and communication skills. Although slightly less proficient than Group 3, these students appear well-prepared for digital challenges in both academic and professional contexts. Group 2, the digital moderates reported moderate proficiency across all skills. While their scores indicate competence, they suggest room for improvement. This group may benefit most from targeted interventions aimed at enhancing digital skills and boosting confidence. The first group, the digital strugglers (2.48%), was characterized by low self-perceived skills in all areas, representing a vulnerable group that risks being left behind in an increasingly digital world. Their presence underscores the need for intensive support systems and challenges assumptions of uniform digital competency among students.

These profiles highlight the diversity in digital skill levels and suggest tailored educational interventions. Digital experts could benefit from advanced coursework or leadership roles in peer mentoring programs, where experienced students assist those with limited skills [23]. The lower self-assessment in computer skills and the digital strugglers profile highlight the need for foundational skill development and a potential gap that universities must address. Without adequate technical competence, students may face challenges in academic performance and future employment [24], [25]. To address these gaps, universities could introduce mandatory skill assessments for incoming students [26] and incorporate more extensive computer training into the curriculum [27]. Furthermore, the confident majority and digital moderates represent large groups where strategic efforts, such as establishing IT fluency centers, offering specialized training, and integrating technology into both academic courses [28] and everyday activities [5], could greatly enhance overall digital competency and support lifelong learning. Strengthening students' ICT and communication abilities requires a multifaceted approach that includes changing graduate attribute regulations, improving instructional methods, and offering proper professor training in digital skills [10], [29].

While these results provide valuable insights, they should be interpreted cautiously. Research consistently shows that students often overestimate their digital competencies [30], [31]. The assumption that "digital natives" possess inherent digital literacy may lead to overconfidence, masking actual skill gaps. Future studies should therefore corroborate self-assessments with objective measures to gain a more accurate understanding of students' true abilities. Moreover, self-perceptions can be influenced by factors such as confidence, access to resources, and prior experience. For instance, students in the digital strugglers group may have lower self-esteem or less exposure to digital tools, which could contribute to their lower self-assessments. The present study did not account for contextual variables like socioeconomic background or institutional resources, which could also significantly impact students' perceived proficiency levels. These limitations suggest that future research should consider objective measures of skill assessment to validate the self-reported data.

4. CONCLUSION

This study examined the self-perceived computer, ICT, and communication skills of Thai Rajabhat University students and identified distinct skill profiles through LPA. The results indicate high levels of self-reported proficiency, particularly in communication and ICT skills, while computer skills were rated slightly lower. The LPA provided a more nuanced view by identifying four distinct student groups, ranging from highly proficient digital experts to lower-performing digital strugglers. The identification of these groups underscores the need for tailored educational interventions. Digital strugglers require targeted support to prevent them from falling behind in an increasingly digital academic and professional environment. At the

same time, digital experts could benefit from advanced coursework or leadership roles, leveraging their strengths to enhance peer learning. Future research should incorporate objective assessments to validate self-reported skill levels and explore contextual factors, such as socioeconomic background, that may influence these competencies. By doing so, universities can better align their curricula with the diverse needs of their students, ultimately enhancing their digital readiness and future employability.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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Jirattikorn Siphai						✓			✓				✓	
Jittirat Saengloetuthai						✓			✓			✓		
Jaruwan Sakulku	✓			✓					✓	✓	✓			

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest. No financial, personal, or professional interests could have influenced this work.

INFORMED CONSENT

Informed consent was obtained from all participants before data collection. Participants were informed about the study's purpose, procedures, and their rights to withdraw at any time. All data were collected and processed anonymously to protect participants' privacy.

ETHICAL APPROVAL

This research complied with all relevant national regulations and institutional policies and is in accordance with the tenets of the Helsinki Declaration. The study was approved by the Chaiyaphum Rajabhat University Ethics Committee on Human Research (approval number: HE 66-2-046).

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author [JS], upon reasonable request.

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