

Digital Skills Gap in Developing Countries: The Case of Myanmar

1st Myo Thida
Dept. of Computer Engineering
Chiang Mai University
Chiang Mai, Thailand
ORCID: 0000-0002-5259-4010

2nd Nang ThaZin
Researcher and Data Analyst
Women in Technology (Myanmar)
Yangon, Myanmar
nangthazin2023@gmail.com

Abstract—The rapid advancements in AI have transformed industries, increasing productivity. However, they have also widened the gap between developed and developing countries, necessitating digital skills to bridge the divide and ensure equal access to opportunities. This research examines the distribution of digital skills of the daily internet users in Myanmar, revealing that participants demonstrated *Intermediate level of digital skills* in various areas, with lower scores in communication, collaboration, and digital content creation. Age, education, and gender weakly correlate with digital skills. Older individuals have slightly lower proficiency, while high school graduates score lower on average but perform well in information/data literacy and digital content creation. Males score higher in data literacy, problem-solving, and digital safety, while females excel in digital content creation, showcasing their creativity. On the other hand, digital access, particularly Wi-Fi availability at home, and financial capability, strongly correlated with higher scores. Addressing these disparities requires prioritizing access to digital resources and implementing educational initiatives for marginalized groups, focusing on digital content creation and communication skills.

Index Terms—Equitable AI, Digital Skills Gap, Digital Divide, Digital Empowerment

I. INTRODUCTION

Artificial intelligence (AI) is rapidly revolutionizing industries like education, healthcare, manufacturing, and transportation, bringing about substantial transformations [1], [2]. The integration of AI-powered technologies has yielded notable benefits, including increased productivity, enhanced efficiency, and improved decision-making. However, it is crucial to acknowledge that these advantages are not uniformly distributed. The availability of AI technology creates a disparity, favoring those with access while leaving others at a disadvantage. This discrepancy contributes to the widening digital skills gap, which carries negative consequences.

The term “digital divide” denotes the gap that exists between individuals who have access to digital technologies such as computers, smart-phones, and the internet, and those who lack such access. This divide results in disparities in opportunities and resources among different segments of society. On the other hand, the “digital skills gap” refers to the difference between the skills required in the digital age and the skills possessed by individuals or the workforce.

Efforts to bridge the digital divide are essential, but they alone may not eliminate the persistent digital skills gap caused by educational and knowledge disparities. This gap is a pressing global issue, particularly in developing countries. The Digital 2022 Global report [3] highlights the increasing internet penetration worldwide, including in

developing nations like Myanmar. In recent years, Myanmar has experienced remarkable growth in internet access, enabling a greater number of people to connect with digital technologies. As of January 2022, Myanmar had 23.93 million internet users, accounting for 44.0 percent of the population. Social media usage was also significant, with 15 million users representing 27.6 percent of the total population. Furthermore, Myanmar boasted 64.60 million active cellular mobile connections, surpassing the population and indicating a mobile penetration rate of 118.8 percent [4].

Despite Myanmar’s significant strides in digital connectivity, it is crucial to address the persistent digital skills gap. This gap remains a challenge not only globally but also specifically within developing countries. It stems from disparities in education and knowledge access. To narrow this gap, concerted efforts are required to improve the quality of education, enhance digital literacy programs, and provide training opportunities in digital technologies. Collaboration among governments, private organizations, and communities is essential to empower the population with the necessary skills and knowledge to thrive in an increasingly digital world.

Various methods are available to evaluate digital skills, providing an assessment of an individual’s proficiency and competency in using digital technologies. Online platforms, for example, offer a wide array of standardized tests and assessments that evaluate specific digital skills, such as computer literacy, software proficiency, communication and collaboration abilities, data analysis, digital marketing knowledge, and digital safety. These assessments typically generate objective results and benchmark individuals against established proficiency levels.

The primary objective of this research is to assess the digital skills of participants in Myanmar. The preliminary study is conducted with a group of participants who use the internet every day. This is done to highlight the skill gap even among daily internet users, who can be considered a group with a relatively small digital divide. The study utilizes the EU digital skill-test [5] to evaluate proficiency and knowledge in five key areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. By analyzing the digital skills and knowledge of this specific group, which has regular internet access, the research aims to understand the extent of the digital skills gap in Myanmar. Furthermore, it seeks to identify the factors contributing to the observed disparities

in digital skill scores. This investigation will provide valuable insights into the specific areas of digital literacy that require improvement and enable the formulation of strategies to bridge the digital skills gap in the country.

The next subsection will highlight the motivation and contributions of this research, followed by a section that provides an overview of related work in the literature. The detailed methodology, which includes data collection, data pre-processing, and the results of the exploratory data analysis, will be presented in Section III. Section IV will provide the key findings and recommendations. Finally, the paper will conclude with a summary and suggestions for future research in the final section.

A. Motivation and Contributions

This research is motivated by the pressing need to narrow the digital skills gap in Myanmar. Despite the growth in internet penetration and access to digital technologies, it is crucial to understand the extent of the skills gap and identify the contributing factors. The primary objective of this research is to shed light on the specific areas of digital literacy that require improvement and develop strategies to bridge the digital divide in the country. The research makes the following significant contributions:

- **Understanding the Extent of the Digital Skills Gap:** This research aims to contribute to a comprehensive understanding of the digital skills gap in Myanmar. By assessing the digital skills and knowledge of a specific group of participants who have regular internet access, valuable insights will be gained regarding the existing disparities and the areas that need improvement.
- **Identification of Contributing Factors:** An essential contribution of this research is the identification of factors that contribute to the observed disparities in digital skill scores. By analyzing the data collected from the participants, the research seeks to uncover underlying causes such as educational disparities or limited access to resources. This understanding is vital for formulating targeted strategies that address these factors and effectively bridge the digital skill gap in Myanmar.

II. LITERATURE REVIEW

Numerous studies have investigated the digital skills gap across various populations, exploring levels of digital literacy, identifying strengths and weaknesses, and examining contributing factors. These studies cover domains such as education, hospitality and tourism, healthcare, and societal participation.

Inamorato et al. conducted a study in collaboration with the JRC and Metared [6], evaluating the digital competence of academics in universities across seven countries. The findings indicate that most academics possess an intermediate level of digital competence, with variations in specific areas. Factors such as age, gender, and institutional support were considered, leading to recommendations for enhancing professional development in higher-education institutions.

Another study by Meisner et al. [7] focused on the impact of the sudden shift to online instruction during the COVID-19 pandemic, examining the experiences of teachers transitioning to full online teaching. The findings underscore the

importance of both technological proficiency and pedagogical approaches to effectively engage and motivate students. Teachers faced challenges, particularly in areas beyond their control, such as parental support, student motivation, and access to technology. The study highlights the necessity for professional development opportunities, teacher collaboration, and efforts to address digital equity gaps for inclusive online education.

Furthermore, García et al. [8] analyzed the self-assessment responses of teacher trainees in Melilla, using the Spanish adaptation of the European Framework for Digital Competence of Educators. The study revealed gaps in digital competence, particularly in security, emphasizing the necessity for enhanced training aligned with the framework, considering the educational context and the knowledge required for effective teaching. Developing digital competence among educators is crucial for supporting students and promoting digital literacy in educational settings.

In a European study by Sheena et al. [9], findings on digital skills gaps in the tourism and hospitality industry were presented. The research involved respondents from various tourism sectors and countries, highlighting the need for digital skills in areas such as online marketing and social media. Gaps in emerging technologies like artificial intelligence and virtual reality were also identified. The study emphasized the importance of addressing these gaps to meet the industry's future demands.

Moreover, the inefficiency of digital skills among healthcare professionals has been recognized [10]. Efforts have been made to empower patients and health workers, promoting skills and digital literacy. In a separate study by Navarro et al. [11], the status of digital skills training among Spanish healthcare professionals was examined. Nurses were found to have received less training compared to physicians, indicating a need for comprehensive technology training to ensure quality care.

Overall, these studies shed light on the digital skills gap across different sectors and populations, highlighting the importance of addressing these gaps through professional development, collaboration, and targeted training programs.

III. METHODOLOGY

A. Data Collection

The data collection process was conducted at the "Career in Digital Age Event," which specifically targeted youths seeking tech jobs. Additionally, data was also collected through online communities such as "Women in Tech (Myanmar)" using an online survey form. A total of 54 participants took part in the data collection process, including 21 male participants, 19 female participants, and 14 participants who did not specify their gender. The participants' age range varied from 18 to 46 years old whereas in terms of education, there were 17 participants with a high school education, 23 participants with a Bachelor's degree, 6 participants with a Master's degree, and 4 participants with a PhD. The survey form consisted of three components:

- 1) Informed consent: Participants were provided with an explanation of the study's purpose and how their data would be used, with a focus on ensuring their privacy and anonymity.

- 2) Pre-survey questionnaire: Demographic information was gathered through a questionnaire, including age, gender, educational background, type of digital divide experienced, main internet activities, and the amount of money spent on internet-related expenses.
- 3) EU digital skill-test scores: Participants were asked to complete the EU digital skill-test [5], which assessed proficiency and knowledge across five key areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. Participants reported their test scores as part of the data collection process.

B. Data Pre-processing

To ensure data consistency and improve its quality, the following data pre-processing tasks were performed:

- Verification and removal of incomplete data: The self-reported test scores were cross-checked with the report from the EU digital skill-test. Any discrepancies or outliers were identified and addressed. Participants who did not provide or report their test scores were excluded from further analysis, resulting in 50 valid responses.
- Extraction of age: The participants' ages were extracted from the date-of-birth attribute, creating a separate age variable. This enables age-related analysis and segmentation, facilitating a deeper understanding of the data.
- Text cleaning: Text cleaning techniques were applied to the education background and reported primary activities performed on the internet. This involved standardizing and normalizing the data by removing special characters, converting text to lowercase, eliminating stop words, and addressing misspelled words or abbreviations. These measures improve the quality and consistency of the data for subsequent analysis.

C. Exploratory Data Analysis

1) **Participant Profile:** Figure 1 presents the demographic characteristics of the study participants. The survey achieved a balanced gender representation, with 40% male participants and 38% female participants. The education level of the participants varied, spanning from high school graduates to individuals holding a PhD. The majority of participants were Bachelor's degree holders, accounting for 46% of the sample, followed by high school graduates, who constituted 34% of the participants.

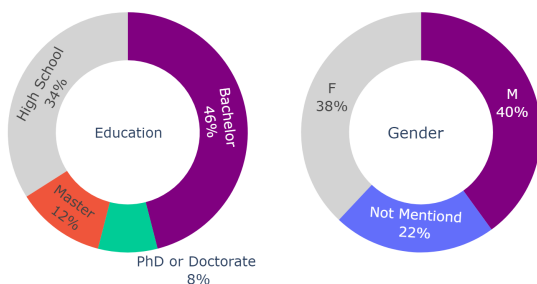


Fig. 1. Gender and Education Background of participants

The activities carried out by the participants on the internet are illustrated in Figure 2. The predominant activities chosen by the participants include Education and Learning, selected by 86% of the participants as one of their main activities, followed by Communication and Networking (80%) and Information search and research activities (78%). Additionally, entertainment and work/professional activities are also significant, with each accounting for 66% of the participants' main activities.

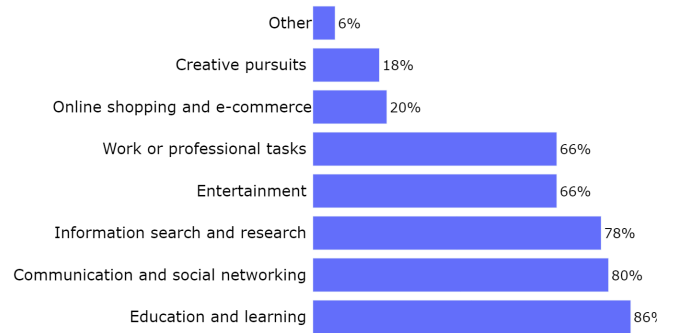


Fig. 2. Primary activities performed on the internet

2) **Scores Statistical Description:** The European digital skill-test [5] is divided into five areas:

- Area 1: Information and data literacy
- Area 2: Communication and collaboration
- Area 3: Digital content creation
- Area 4: Digital Safety and
- Area 5: Problem Solving

After the assessment, the scores for each competence group are classified into six proficiency levels:

- Foundation Level 1
- Foundation Level 2
- Intermediate Level 3
- Intermediate Level 4
- Advanced Level 5
- Advanced Level 6

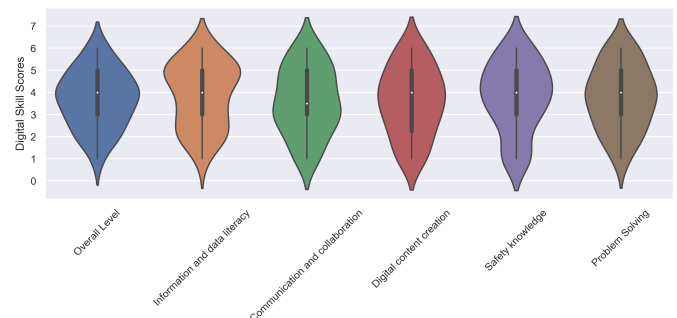


Fig. 3. Comprehensive overview of the digital skill scores

Figure 3 presents a comprehensive overview of the digital skill scores of the 50 participants across different areas. The left-most box displays the overall score, while the average score for the participants is 4 (Intermediate) across most skill areas. However, the communication and collaboration skills score falls slightly lower in the lower intermediate range, reflecting the participants' proficiency in utilizing digital

communication and collaboration tools. The inter-quantile ranges, which represent the range between the 25th and 75th percentiles, are similar for all the skill groups except for the digital content creation. This indicates that the daily internet users in the study possess a similar level of skills across most areas, but exhibit some variation in their proficiency in digital content creation.

Next, the study aims to investigate the factors that contribute to the observed disparities in digital skill scores. Specifically, the study will examine the relationships between age and score, educational background and score, digital access and score, and other relevant factors. By analyzing these factors, we can gain insights into the potential influences on participants' digital skill levels.

3) **Age vs. Digital Skills:** The correlation coefficient in Table I reveals the relationship between age and competency levels in various skill groups. It indicates a weak correlation between age and digital skill scores overall. However, as participants' age increases, there is a noticeable decline in scores for Information and Data Literacy as well as Digital Content Creation. On the other hand, there exists a weak positive correlation between age and the other areas, namely Communication and Collaboration, Digital Safety, and Problem Solving.

TABLE I
SNAP-SHOT OF THE COLLECTED DATA-SET

	Correlation Score
Overall Level	-0.01
Information and data literacy	-0.01
Communication and collaboration	0.03
Digital content creation	-0.04
Safety knowledge	0.01
Problem Solving	0.19

Figure 4 shows the scattered distribution of overall scores across the age range. Within each age group, there is considerable variation in scores, with individuals of the same age displaying a wide range of skill levels, from 1 to 6.

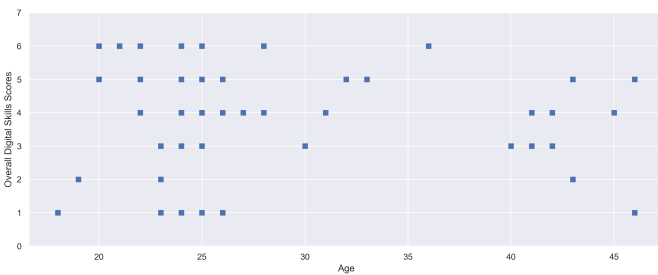


Fig. 4. Age vs. digital skill scores

However, when examining the average scores across different age groups, an interesting trend emerges. On average, participants in the age group older than 35 tend to have lower digital skill scores compared to younger age groups. This suggests that there may be a slight inverse relationship between age and digital skill scores, with older individuals generally demonstrating slightly lower proficiency.

It is important to note that while the overall relationship between age and digital skill scores is not strongly correlated,

the observed trend of lower average scores in the older age group provides valuable insights. This finding highlights the potential impact of age on digital skill acquisition, suggesting that older individuals may face additional challenges or have different experiences in developing their digital competencies compared to younger counterparts.

4) **Gender vs. Digital Skills:** In Figure 5, it can be observed that males tend to exhibit slightly higher scores compared to their female counterparts, particularly in the areas of data literacy, problem solving, and digital safety knowledge. On the other hand, female participants show better performance in digital content creation, showcasing their creativity in this skill category. These findings suggest that there may be slight gender-based differences in digital skill proficiency, with males showing strength in certain areas and females excelling in others.

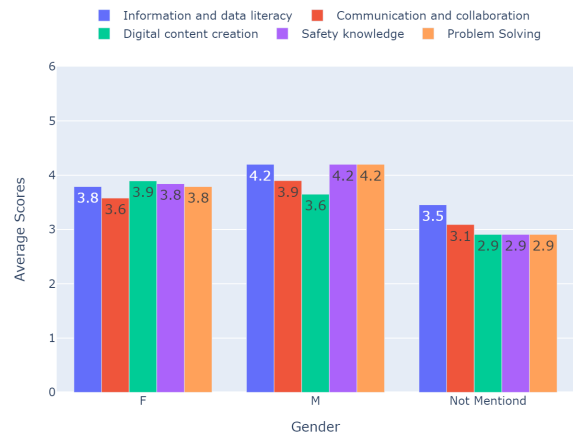


Fig. 5. Gender vs. Digital Skill Scores

Additionally, there is a group of participants who did not mention their gender preference. Interestingly, this group tends to have lower scores in all competency groups. Further investigation is needed to understand the reasons behind this disparity and to determine if other factors, such as experience, education, or individual preferences, play a role in these outcomes.

5) **Education Background vs. Digital Skills:** In Figure 6, the digital skill scores are analyzed based on the participants' education backgrounds. Here are the key findings:

- High school graduates generally have lower average digital skill scores compared to participants with higher education levels. However, they perform relatively well in information and data literacy and digital content creation.
- Both Bachelor's degree and Master's degree holders exhibit similar average scores across all skill categories. However, they tend to have lower scores in digital content creation and the use of digital tools for communication and collaboration.
- Participants with a PhD or doctorate degree have the highest average scores among all education groups in all five skill categories. They particularly excel in problem-solving, showcasing their proficiency in addressing digital challenges.

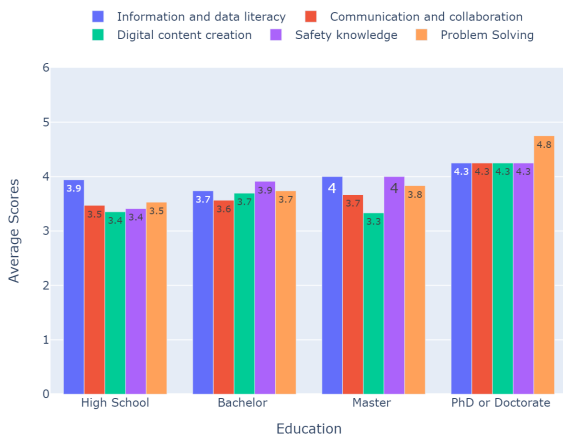


Fig. 6. Digital Skill Scores vs. participants' education backgrounds

These findings highlight the crucial role of higher education in developing and strengthening digital skills. Participants with advanced degrees consistently demonstrated stronger proficiency across various skill areas, indicating that higher education provides valuable knowledge and training in digital competencies. For instance, individuals with Master's or PhD degrees often possess specialized knowledge and research experience, which can contribute to their higher digital skill scores in areas like problem-solving and digital safety. However, it's essential to recognize that education level is not the sole determinant of digital skill proficiency. Participants with lower education levels, especially those falling into younger age groups, showcased commendable performance in certain skill categories. For example, their familiarity with digital technologies from an early age might have contributed to their proficiency in information and data literacy.

6) **Digital Access vs. Digital Skills:** The box plots in Figure 7 provide a clear visual representation of the influence of Wi-Fi access on participants' digital skill scores.

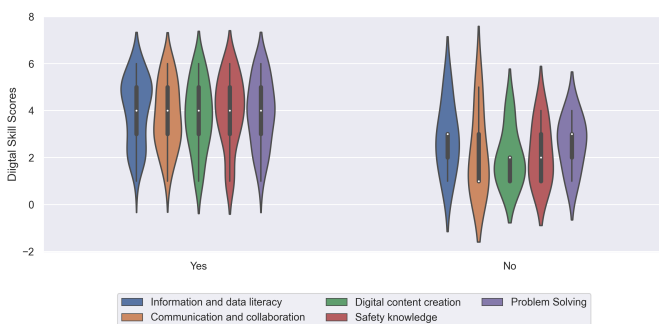


Fig. 7. Digital Skill Scores vs. Wi-Fi Access

The data shows a distinct difference between individuals who have Wi-Fi access at home and those who do not. Those with Wi-Fi access demonstrate significantly higher skill scores in all areas compared to those without access. Participants with Wi-Fi access display less variability in skill levels, with an average score of approximately 4 (Intermediate) and a standard deviation of 1.5, indicating a consistent level of digital skills. The interquartile range (IQR) of 2

suggests that most participants with Wi-Fi access fall within a narrower range of skill scores, highlighting the impact of Wi-Fi access on digital skill development.

On the other hand, participants without Wi-Fi access achieve lower-intermediate and foundation level scores, with a wider range of skill levels. On average, their highest scores are in information and data literacy (mean score of 2.8, lower intermediate), followed by problem-solving skills (mean score of 2.6). Communication and collaboration skills receive the lowest average score of 2.2. These participants exhibit diverse skill levels, ranging from 1 (foundation) to 4 or 5. Notably, the IQR for digital content creation ranges from 1 to 2, indicating a relatively narrower range of scores. Overall, these findings underscore the significant influence of Wi-Fi access on digital skill levels and highlight the disparities between participants with and without access.

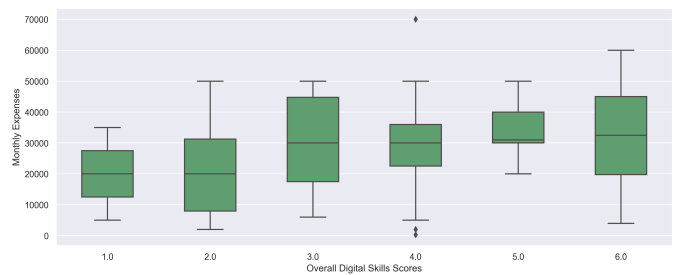


Fig. 8. Digital Skill Scores vs. Monthly Expenses

The participants' monthly expenses for internet usage varied from 300 to 70,000 Myanmar Currency. Figure 8 demonstrates a correlation between the amount participants can afford to spend and their digital skills scores. Generally, those who can afford higher expenses tend to have higher scores in digital skills. This indicates a positive relationship between financial capability and proficiency in digital skills.

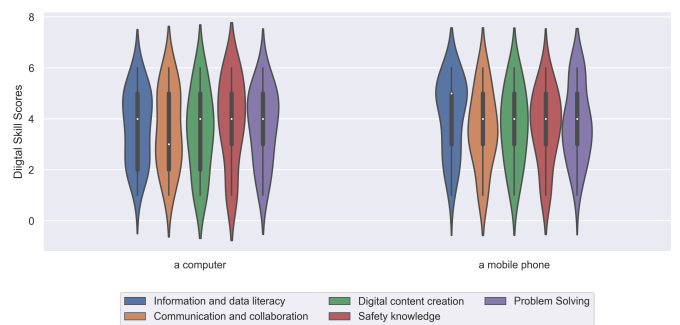


Fig. 9. Digital Skill Scores vs. Digital Device

On the other hand, the analysis of digital device usage in Figure 9 reveals that the type of device used to access the internet does not have a significant impact on participants' digital skill levels. Among those who primarily use a computer, the average scores range from 3.5 to 3.8, with the lowest score observed in digital content creation and the highest in digital safety knowledge. On the other hand, participants who primarily use a mobile phone to access the internet have average scores ranging from 3.6 to 4, with the lowest score in communication and collaboration and the highest in digital literacy. Notably, the group using

computers exhibits a higher interquartile range compared to the group using mobile phones. These findings indicate that the choice of digital device does not appear to be a significant factor contributing to variations in digital skill levels among participants.

IV. RESULTS AND DISCUSSION

The analysis of the data collected from the survey revealed several key findings.

A. Key Findings

- Firstly, the participants' digital skills showed similar levels across different areas, with an average score of 3.8 (Intermediate) for information and data literacy, safety knowledge, and problem-solving. However, the average scores were slightly lower, around 3.5, for communication and collaboration, as well as digital content creation.
- When examining demographic factors, it was found that age, educational background, and gender had a weak correlation with digital skills. Male participants tended to perform slightly better than female participants, indicating a gender gap in digital proficiency. Furthermore, younger age groups demonstrated slightly higher digital skill levels compared to older age groups. Higher education was associated with higher proficiency in digital skills, suggesting the importance of educational attainment in fostering digital literacy.
- The study showed that digital access strongly correlated with participants' digital skill scores. Those with Wi-Fi access at home scored higher than those without. Financial capability also positively correlated with digital skill scores, with those able to afford higher expenses achieving higher scores. The type of digital device used to access the internet did not significantly influence scores, highlighting that resource accessibility matters more than the specific device.

The findings underscore the urgency of addressing the unequal distribution of digital technologies and skills in Myanmar. To ensure equal opportunities for all individuals to acquire digital skills, it is crucial to prioritize access to digital resources, including widespread availability of Wi-Fi at home. Moreover, targeted educational initiatives that focus on marginalized groups and provide comprehensive digital literacy training, with a specific emphasis on digital content creation as well as communication and collaboration skills, can play a pivotal role in bridging the existing digital skills gap.

It is important to acknowledge the limitations of this study. The findings are based on a specific sample of 54 participants and may not be fully representative of the entire population of Myanmar. Additionally, the study relied on self-reported data and the EU digital skill test conducted in the English language, which may introduce response bias and language barriers. To mitigate these limitations, future research should consider translating the digital skill test to the local language and expanding the sample size to include a more diverse range of participants.

V. CONCLUSION

In conclusion, the rapid advancements in AI have brought about significant transformations across industries, resulting in increased productivity and efficiency. However, these advancements have also accentuated the widening gap between developed and developing countries, underscoring the critical importance of digital skills in bridging this divide and ensuring equitable access to opportunities in the digital era.

This study contributes to our understanding of the factors that contribute to disparities in digital skills within Myanmar. By recognizing the influence of factors such as digital access, age, educational background, and gender, policymakers and stakeholders can develop targeted interventions and policies to promote equal access to digital opportunities and bridge the digital divide and skill gaps. Continued research and collaboration are essential in fostering a more inclusive and digitally empowered society, not only within Myanmar but also in the broader context of an equitable AI-driven world.

ACKNOWLEDGMENT

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Data Availability

The research finding is published as a publicly accessible data visualization dashboard, available at <https://www.istarvz.com/projects/digital-skill-gap>. The data supporting the study's findings can be obtained from the corresponding author upon reasonable request.

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