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# Developing employability digital competencies of Thai Gen Z business students: The role and matter of digital learning environments and digital adaptation skills

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ABSTRACT

This study investigates the relationships among the digital learning environment (i.e., learning management systems e.g., Moodle, Google Classroom, virtual collaboration tools e.g., Zoom, Padlet), digital adaptation skills, and employability digital competencies among Generation Z business students in Thailand. Data were collected using convenience sampling from 445 Thai Gen Z business students via online questionnaires. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze the collected data. Results indicate that the digital learning environment significantly and positively impacts digital mindset, digital adaptation skills, and employability digital competencies. Such skills are not only desirable traits but also enablers of sustained employability, as they equip individuals to thrive amid rapid digital transformation and evolving industry demands. Additionally, indirect effects were observed from the digital learning environment to employability digital competencies through digital mindset and digital adaptation skills. These findings highlight the importance of enhancing the quality of digital learning environments to foster digital skills and enhance the competitiveness of Generation Z students in the future digital labor market. Apart from that, the empirical results imply that to foster employability, educational policies should emphasize not just digital access, but also pedagogical approaches that cultivate adaptive digital mindsets and broad-based digital skills among learners.

## 1. Introduction

In today's digital era, where technological advancements reshape nearly every sector, the development of digital competencies has become a critical priority for individuals entering the workforce. This is especially pertinent for Generation Z students, who have grown up immersed in digital technologies. Preparing these learners for future careers involves not only strengthening their academic

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knowledge but also cultivating the digital capabilities that modern employers require (Lazar et al., 2023). This study investigates the relationship between digital learning environments and employability digital competencies among Generation Z business students in Thailand, with particular attention to the mediating roles of digital mindset and digital adaptation skills.

A digital learning environment encompasses the integration of technology into educational practice—spanning online platforms, learning management systems (e.g., Moodle, Google Classroom), virtual collaboration tools (e.g., Zoom, Padlet), and digitally mediated instruction for remote or hybrid learning. These environments not only promote technological literacy but also enhance students' adaptability and engagement in dynamic learning contexts (Haleem et al., 2022). By interacting with these technologies, students develop practical skills in digital communication, data handling, and networked collaboration—core competencies in today's digital labor market (Meirbekov et al., 2022; Kopackova et al., 2024).

A key enabler of this adaptability is the digital mindset—an open, proactive approach to leveraging technology for value creation. Students with a strong digital mindset are more responsive to change, capable of innovative problem-solving, and inclined toward collaboration in evolving digital settings (Suarta & Suwintana, 2021). Closely linked to this is digital adaptation skill, which reflects one's ability to learn and apply new technologies across educational and professional contexts. These skills enable students not just to meet digital demands but to excel within them, making them vital assets for employability in rapidly changing environments (Audrin et al., 2024).

Employability digital competencies encompass a range of essential skills, including proficiency with digital tools, problem-solving in technology-mediated contexts, effective digital communication, and collaboration within online platforms. These competencies are best cultivated through hands-on interaction with technology, which helps bridge the gap between theoretical instruction and practical application. While foundational knowledge remains important, experiential learning plays a critical role in equipping students with the capabilities needed to navigate real-world digital challenges (Zhong & Juwaheer, 2024). This underscores a notable shortfall in many current curricula (Ciarli et al., 2021; Deschênes, 2024), which often underemphasize applied learning opportunities (Allen, 2020). Integrating digital projects, internships, and problem-based tasks into educational programs is therefore crucial for aligning student competencies with the dynamic demands of the modern labor market. This study offers a nuanced exploration of how digital learning environments shape employability digital competencies, mediated by students' digital mindset and adaptability. In this regards, the findings also contribute to practical insights for curriculum development and instructional strategies aimed at fostering workforce readiness in increasingly digital professional landscapes.

## 2. Literature review

### 2.1. Digital learning environment

A Digital Learning Environment refers to a system or context designed with digital technology to support learning and skills development. It includes various learning modalities such as online platforms, virtual classrooms, and digital tools that enrich learning experiences (Thoma et al., 2019). Such environments are specifically crafted to meet the evolving needs of digital-era students, who seek flexibility, modern learning approaches, and easy access to diverse educational resources. Generation Z students, having grown up in a technology-rich context, are naturally proficient in using digital tools for learning, making digital learning environments crucial for their skill development (Afzal et al., 2023).

The role of digital learning environments in skill development is multifaceted. It not only enhances students' academic skills but also strengthens critical digital competencies necessary for future careers, such as technological communication, data management, and online collaboration (Adeshina, 2024). Students engaging with digital learning platforms can access educational content anytime, enabling flexible learning experiences and better adaptability to technological changes. Furthermore, these environments encourage independent learning and personal responsibility in managing one's education—skills essential in an era that increasingly values adaptability (Mhlongo et al., 2023).

However, the effectiveness of digital learning environments can be influenced by several factors, including technological readiness, institutional support, and students' digital literacy (Jones & Brown, 2020). When educational institutions provide modern technological infrastructure and adequate support for technology-enhanced learning, students' ability to develop digital skills is significantly improved. Additionally, students' proficiency in accessing and effectively utilizing digital tools determines the overall success of their learning experience within such environments (Liu et al., 2023). Therefore, enhancing students' digital capabilities ensures they acquire essential competencies required in the digital workplace (Timotheou et al., 2023).

### 2.2. Digital mindset

A digital mindset refers to an individual's ability to adapt to, understand, and effectively use digital technologies for both personal and professional purposes (Mirhabibi et al., 2025). This mindset encompasses openness to technological change, creativity in solving problems using digital tools, and a broad understanding of the digital ecosystem (Costa et al., 2023). Developing a strong digital mindset is crucial for equipping students with the skills needed to thrive in increasingly technology-driven work environments. It enhances learners' adaptability and innovation, allowing them to leverage digital tools efficiently in learning and workplace contexts (Imjai et al., 2024; Goulart et al., 2022).

The global literature provides a broad foundation for understanding the relationship between digital environments and employability, it is crucial to contextualize this research within Thailand's unique educational and technological landscape. For instance, Imjai et al. (2024) examined Thai higher education students' readiness for digital learning environments and found that digital

mindset and adaptation vary significantly across provinces, depending on institutional support and access to infrastructure. Similarly, the World Bank (2023) reported that approximately 74.1 % of Thai youth and adults underperform in foundational digital skills, indicating a significant skills crisis that hampers employability in the digital economy. Furthermore, Intaratat (2021) highlighted the urgent need for reskilling and upskilling initiatives to bridge the digital competency gap, especially in the post-COVID-19 context. These local studies underscore that while global digital trends influence higher education, Thailand-specific challenges—such as uneven digital infrastructure and curriculum gaps—require localized approaches to developing employability digital competencies. By incorporating these insights, this study offers a nuanced analysis that reflects the realities of Gen Z business students in Thailand.

While prior research underscores the importance of fostering digital mindsets among students, critical gaps and limitations remain underexplored. For example, Timotheou et al. (2023) emphasize the role of institutional support in cultivating digital mindsets but rely on cross-sectional data drawn from a relatively homogenous student sample in Europe, limiting the generalizability of their conclusions. Similarly, Haleem et al. (2022) highlight the significance of technological access in digital competency development, but their study lacks a longitudinal perspective and does not account for the variability in infrastructure quality across different educational contexts. Additionally, while both studies point to the importance of digital adaptation and flexibility, they do not examine how these competencies evolve over time or interact with employability outcomes. These methodological constraints, including regional focus and self-reported measures, suggest the need for more robust, longitudinal, and cross-contextual investigations—particularly in emerging economies like Southeast Asia where digital learning environments and challenges differ significantly. Our study aims to fill this gap by examining the dynamic interplay between digital learning environments, mindsets, and competencies within a Thai higher education context.

### 2.3. Digital adaptation skills

Digital adaptation skills refer to an individual's ability to adapt to and effectively utilize digital technologies within rapidly changing contexts. These skills encompass the capacity to learn and implement emerging technologies relevant to professional or everyday tasks, as well as to continuously develop knowledge and understanding of evolving technological landscapes. Digital adaptation involves more than merely learning how to use new digital tools; it also includes cultivating resilience and flexibility to manage challenges arising from ongoing changes in the digital environment (Ciarli et al., 2021). This skill set is particularly crucial in the current era, characterized by rapid technological advancements influencing various sectors, including education, employment, and daily life.

The role of digital adaptation skills is critically important in enhancing employability, especially in labor markets continuously demanding updated technological competencies. Effective adaptation to technological shifts significantly enhances students' preparedness for using digital technologies to support efficient workplace practices (Abdul Hamid, 2022). Furthermore, digital adaptation skills contribute substantially to developing associated competencies such as problem-solving, collaborative work in digitally-rich environments, and critical thinking, all of which are indispensable in the contemporary digital context. Students who possess strong digital adaptation capabilities are more likely to quickly master new technologies and effectively apply them within practical workplace scenarios, thereby gaining a competitive advantage in dynamic job markets (Shen et al., 2023).

Several factors influence the development of digital adaptation skills among students, including the availability of technological resources, institutional support, and students' attitudes toward learning and adopting new technologies (Haleem et al., 2022). Access to modern technological infrastructure and continuous training significantly facilitate students' ability to enhance their digital adaptation skills. Moreover, supportive academic environments, characterized by curricula that prioritize technology integration into teaching and learning processes, play a crucial role in fostering students' adaptation skills (Ersoy-Babula & Babula, 2018). Therefore, both institutional support and proactive educational strategies are vital in cultivating robust digital adaptation skills among students.

### 2.4. Employability digital competencies

Employability digital competencies refer to a multidimensional set of skills that enable individuals to navigate and utilize digital technologies effectively in professional environments. These competencies are not only critical for performing job-specific tasks but also for adapting to the fast-evolving demands of the digital economy. Employers today increasingly seek graduates who can leverage digital tools to enhance productivity, foster innovation, and support organizational agility. Core areas of these competencies include digital communication, data and information literacy, digital problem-solving, and collaboration through digital platforms. Furthermore, they encompass the ability to integrate and apply digital tools creatively to solve complex problems and develop innovative solutions—skills that are becoming indispensable in data-driven, remote, and hybrid work environments (Siddoo et al., 2019; Poláková et al., 2023).

A deeper examination reveals that employability digital competencies consist of several interrelated components, each with specific workplace applications. Digital communication skills refer to the ability to effectively engage in professional discourse via digital means—such as using platforms like Microsoft Teams, Zoom, or Slack for synchronous communication, and email or collaborative documents for asynchronous interaction. Digital problem-solving skills involve diagnosing technical or strategic challenges and utilizing technology—such as data visualization software (e.g., Tableau, Power BI) or project management tools (e.g., Trello, Asana)—to formulate efficient solutions (Deschênes, 2024). Meanwhile, digital tool usage skills reflect proficiency in software and platforms commonly used in professional settings, including word processing, spreadsheet analysis, and content management systems, which enhance workflow automation and decision-making accuracy. Mastery of these competencies not only increases individual performance but also aligns graduates' capabilities with the expectations of employers across digitally intensive industries.

Several factors contribute significantly to the development of employability and entrepreneurial competencies among students. Key among these is access to modern digital technologies—such as advanced computers, specialized software, artificial intelligence, and high-speed internet—which play a crucial role in facilitating students' exposure to and mastery of essential digital skills (Duong & Nguyen, 2024; Haleem et al., 2022). Institutional support is another influential factor; universities that offer targeted courses or specialized training programs in digital competencies substantially enhance students' employability potential (Herbert et al., 2020). Moreover, practical work experiences, including internships and real-world projects, provide opportunities for students to apply their digital skills in authentic professional settings, reinforcing the relevance and value of these competencies in the labor market (Mendoza-Villafaina & López-Mosquera, 2024).

Despite the increasing scholarly focus on digital competencies and employability, notable gaps remain in the existing literature. For instance, much of the current research relies on cross-sectional data, limiting insight into how digital competencies evolve over time in response to ongoing technological advancements. Longitudinal studies are needed to better capture these dynamics. In addition, there are inconsistencies in findings concerning the impact of digital adaptation skills on employability; while some studies report a strong positive link, others suggest weaker or insignificant relationships, indicating the need for further clarification. Furthermore, little attention has been given to Generation Z business students in emerging economies such as Thailand, who engage with digital learning environments under distinct cultural, institutional, and technological conditions. These gaps underscore the need for the present study, which investigates how digital learning environments, digital mindset, and digital adaptation skills influence the development of employability digital competencies within a Thai higher education context.

Based on the literature review, the researcher identified key constructs and observable variables associated with Digital Learning Environments, Digital Mindset, Digital Adaptation Skills, and Employability Digital Competencies. These variables were clearly defined to support the development of the questionnaire and ensure conceptual clarity. Table 1 outlines the operational definitions, component variables, and measurement indicators employed in the study. All indicators were adapted from previously validated instruments, with appropriate references provided to acknowledge their original sources.

**Table 1**
Component variables and indicators of digital learning environment, digital mindset, digital adaptation skills and employability digital competencies.

| Variables | Component Variables | Indicators | Sources |
|---|---|---|---|
| Digital Learning Environment (DLE) | Use of Online Platforms (UOP) | Easy access to online learning platforms.<br>Effective learning through online platforms. | Thoma et al. (2019) |
| | Use of Digital Tools (UDT) | Use of digital tools for data management.<br>Effective communication using digital tools. | Afzal et al. (2023) |
| | Independent Learning (IL) | Ability to plan independent learning.<br>Independent learning enhances responsibility. | Adeshina (2024) |
| | Institutional Support (IS) | Institutional support for using technology.<br>Adequate technological resources provided by the institution. | Timotheou et al. (2023) |
| Digital Mindset (DM) | Adaptability to Digital Technologies (ADT) | Quickly learn new technologies.<br>Competent in using digital tools. | Costa et al. (2023) |
| | Creative Problem-Solving (CPS) | Innovative thinking using digital tools.<br>Creating new solutions using technology. | Imjai et al. (2024) |
| | Flexibility in Technological Contexts (FTC) | Quick adaptation to technological changes.<br>Openness to technological change. | Goulart et al. (2022) |
| | Practical Experience (PE) | Applying digital skills in various contexts.<br>Real-world experiences enhance digital skills. | Timotheou et al. (2023) |
| Digital Adaptation Skills (DAS) | Ability to Learn New Technologies (ALNT) | Rapidly learning new technologies.<br>Self-learning unfamiliar technologies. | Ciarli et al. (2021) |
| | Flexibility in Digital Environment (FDE) | Quick adaptation to digital environments.<br>Versatility in using various technologies. | Abdul Hamid (2022) |
| | Problem-Solving Using Technology (PUT) | Applying digital technology in complex tasks.<br>Confidence in using technology to manage tasks. | Shen et al. (2023) |
| | Access to Modern Technology (AMT) | Access to essential technological resources.<br>Appropriate training on new technologies. | Haleem et al. (2022) |
| Employability Digital Competencies (EDC) | Digital Communication Skills (DCS) | Smooth communication via online platforms.<br>Managing digital communication for teamwork. | Siddoo et al. (2019) |
| | Digital Tool Usage Skills (DTUS) | Using applications effectively at work.<br>Adaptability to new digital tools. | Poláková et al. (2023) |
| | Access to Digital Technology (ACDT) | Access to high-speed internet.<br>Access to advanced digital equipment. | Haleem et al. (2022) |
| | Practical Work Experience (PWE) | Experience with digital technologies in real work settings.<br>Real-world experiences strengthen digital skills. | Mendoza-Villafaina and López-Mosquera (2024) |

Note: All indicators and dimensions in this table are adapted from established literature sources.

### 2.5. Hypotheses development

#### 2.5.1. The relationship between digital learning environment and digital mindset

Digital learning environments (DLEs) have been recognized as pivotal in shaping learners' attitudes, behaviors, and adaptability in educational contexts. A DLE is typically characterized by the integration of digital tools, platforms, and resources that enable flexible, collaborative, and self-directed learning. These environments not only enhance digital literacy but also serve as catalysts for developing a digital mindset—a learner's openness, adaptability, and innovativeness in using technology. Prior research suggests that continuous exposure to diverse digital platforms encourages students to adopt a more open-minded and proactive attitude toward technology (Imjai et al., 2024). Such exposure enables learners to flexibly adapt to informal learning settings and evolving digital tools, which are essential characteristics of a digital mindset (Tour, 2015). Moreover, Pan et al. (2024) emphasize that learners' attitudes toward digital environments influence their personal innovativeness and behavior, reinforcing key aspects of a digital mindset. This relationship is strengthened when institutions implement a high degree of digitalization and foster a learning culture that promotes microlearning, self-direction, and digital resource diversity (Chan et al., 2015). In addition, supportive digital learning environments that encourage experimentation and engagement with emerging technologies create conditions where learners become more resilient, tech-confident, and solution-oriented (Athanassiou et al., 2003; Joo et al., 2014). These traits reflect the core of a digital mindset, which includes the willingness to explore, adapt, and innovate within digital systems. Therefore, the following hypothesis one is proposed.

**H1**. Digital Learning Environment positively affects Digital Mindset.

#### 2.5.2. The relationship between digital learning environment and digital adaptation skills

Digital learning environments (DLEs) play a crucial role in developing students' ability to adapt to technological changes. As educational systems increasingly integrate digital tools and platforms, students are provided with opportunities to continuously engage with technology in ways that mirror the demands of modern workplaces. This ongoing exposure enhances their digital adaptation skills, which encompass technical proficiency, information literacy, digital problem-solving, and the ability to revise learning strategies to meet evolving digital requirements (Scherbakova et al., 2023). Students who actively participate in digital learning environments tend to become more independent and confident in navigating unfamiliar technologies and solving problems in dynamic contexts (El-Sabagh, 2021). Such skills are essential for employability, particularly in fields shaped by digital transformation. Empirical findings support that digital environments not only foster technical ability but also psychological readiness and motivation—key dimensions of adaptability (Yaacob et al., 2022; Haleem et al., 2022). For instance, Thuy (2022) found that students with more extensive experience in online learning demonstrated higher levels of digital adaptability, underscoring the developmental impact of immersive digital learning contexts. Furthermore, digital environments that emphasize self-directed exploration and exposure to Industry 4.0 technologies can strengthen students' cognitive flexibility and readiness for continuous learning. These environments serve as incubators for adaptive behaviors, allowing students to build resilience and thrive amid rapid technological advancements. Based on this body of evidence, the following hypothesis two is proposed.

**H2**. Digital Learning Environment positively affects Digital Adaptation Skills.

#### 2.5.3. The relationship between digital learning environment and employability digital competencies

Digital learning environments (DLEs) have emerged as critical enablers in preparing students for the demands of the digital workforce. By integrating technological tools into educational processes, DLEs facilitate the acquisition of key employability digital competencies, such as digital literacy, communication, collaboration, problem-solving, and self-directed learning. These skills are widely recognized by employers as essential for success in technology-driven work environments (Autthawuttikul et al., 2022; Vali, 2023). Empirical studies suggest that students who engage actively in digital learning environments tend to develop superior capabilities in areas such as online collaboration, data analysis, and digital communication. The availability of diverse tools and platforms in DLEs enables students to simulate real-world digital tasks, thereby enhancing their readiness for the modern job market (Mittal et al., 2022). Additionally, access to authentic online learning experiences and learning analytics has been shown to strengthen students' confidence, improve their e-learning competencies, and elevate their perceived employability (Martínez-Argüelles et al., 2023). Research further confirms that the integration of digital technologies in learning settings contributes to the enhancement of students' ICT skills, self-efficacy, and adaptive thinking—competencies that are increasingly sought after in contemporary employment contexts (Metilda & Neena, 2017). DLEs, therefore, serve as catalysts for developing a well-rounded digital skill set that supports career readiness and long-term employability (Pirzada & Khan, 2013). Hypothesis three is developed as follows.

**H3**. Digital Learning Environment positively affects Employability Digital Competencies.

#### 2.5.4. The relationship between digital mindset and employability digital competencies

A digital mindset, defined by openness to innovation, adaptability, continuous learning, and proactive engagement with technology, has been identified as a significant predictor of employability digital competencies. Individuals with a strong digital mindset are more likely to embrace technological change and use digital tools strategically to solve workplace problems and generate value in professional contexts (Martínez-Peláez et al., 2023; Allen, 2020). This mindset supports not only technical proficiency but also creativity and innovation, enabling individuals to apply technology effectively in dynamic organizational environments. Empirical research has shown that students with higher digital mindset levels are better prepared for the demands of the digital economy. They

demonstrate enhanced digital communication, collaboration, business ingenuity, and socio-digital agility—key components of employability digital competencies (Potgieter et al., 2023). Moreover, a digital mindset fosters confidence in one's digital skills and career direction, reinforcing students' perceptions of readiness for the digital workplace. This readiness, in turn, promotes continuous skill development, strategic problem-solving, and the ability to navigate complex digital systems effectively (Hazni & Nurhaida, 2019). Thus, cultivating a digital mindset is not merely beneficial but essential for equipping individuals with the competencies required in digitally mediated work environments. It acts as a psychological enabler that supports lifelong digital engagement and continuous professional growth. The following hypothesis four is formulated.

**H4**. Digital Mindset positively affects Employability Digital Competencies.

#### *2.5.5. The relationship between digital adaptation skills and employability digital competencies*

Digital adaptation skills—defined as the ability to effectively adjust to new technologies, digital platforms, and technological shifts—are essential in preparing individuals for success in increasingly dynamic work environments. These skills enable students to navigate emerging tools, systems, and practices with confidence, enhancing their readiness for employment in the digital economy. Research shows that students who are proficient in adapting to digital change also demonstrate stronger abilities in digital communication, collaboration, and problem-solving—competencies that are highly valued in contemporary workplaces (Vrana, 2016; Fajaryati et al., 2020). Moreover, digital adaptation skills lay the foundation for broader employability digital competencies, including digital literacy, business ingenuity, socio-digital agility, and career resilience (Ferreira et al., 2024). Individuals with high levels of adaptability are not only better equipped to learn and apply new technologies, but also to innovate, collaborate, and evolve alongside rapidly changing digital demands. This adaptability enhances job-seeking outcomes and improves alignment between individual capabilities and labor market needs, sometimes even exceeding the predictive power of formal qualifications (Zamberlan et al., 2024).

In addition, digital adaptation promotes continuous learning, confidence, and proactive engagement with emerging tools, all of which are essential for developing comprehensive employability competencies (Potgieter et al., 2023; Coetzee & Veldsman, 2022). These findings suggest that cultivating digital adaptation skills is a strategic pathway for equipping students with the competencies required to succeed and thrive in the digital workforce. Based on this evidence, the following hypothesis is proposed.

**H5**. Digital Adaptation Skills positively affect Employability Digital Competencies.

Table 2 presents research hypotheses formulated to examine the relationships among the digital learning environment, digital mindset, digital adaptation skills, and employability digital competencies, based on relevant literature. These hypotheses were designed to test the impact of these variables on students' employability in the digital era.

### *2.6. Research model*

To establish a cohesive theoretical foundation, this study proposes a conceptual framework in which the digital learning environment serves as the primary contextual variable influencing students' employability digital competencies. This relationship is mediated by two key individual-level constructs: digital mindset and digital adaptation skills. A digital mindset reflects students' openness to and readiness for technology-driven change, while digital adaptation skills denote their capacity to adjust to and effectively apply emerging digital tools in both educational and professional contexts. The framework integrates cognitive, behavioral, and contextual dimensions of learning, aligning with socio-cognitive and constructivist perspectives on digital competency development. The conceptual framework illustrated in Fig. 1 is an original contribution of this study. It integrates constructs and pathways synthesized from relevant empirical and theoretical studies (Afzal et al., 2023; Audrin et al., 2024; Potgieter et al., 2023; Suarta & Suwintana, 2021) to explain how digital learning environments influence employability digital competencies through digital mindset and digital adaptation skills. Drawing on insights from the literature, particularly the study titled *"Developing Employability Digital Competencies of Thai Gen Z Business Students: The Role and Matter of Digital Learning Environments and Digital Adaptation Skills"*, the proposed framework is presented in Fig. 1.

## 3. Research methodology

### *3.1. Research design*

This research employs a quantitative methodology, focusing on the target population of Generation Z business students in Thailand currently enrolled at undergraduate or higher levels in various educational institutions nationwide. The target population for this

**Table 2**
Research hypotheses.

| No. | Hypotheses |
|---|---|
| H1 | Digital Learning Environment positively affects Digital Mindset. |
| H2 | Digital Learning Environment positively affects Digital Adaptation Skills. |
| H3 | Digital Learning Environment positively affects Employability Digital Competencies. |
| H4 | Digital Mindset positively affects Employability Digital Competencies. |
| H5 | Digital Adaptation Skills positively affect Employability Digital Competencies. |

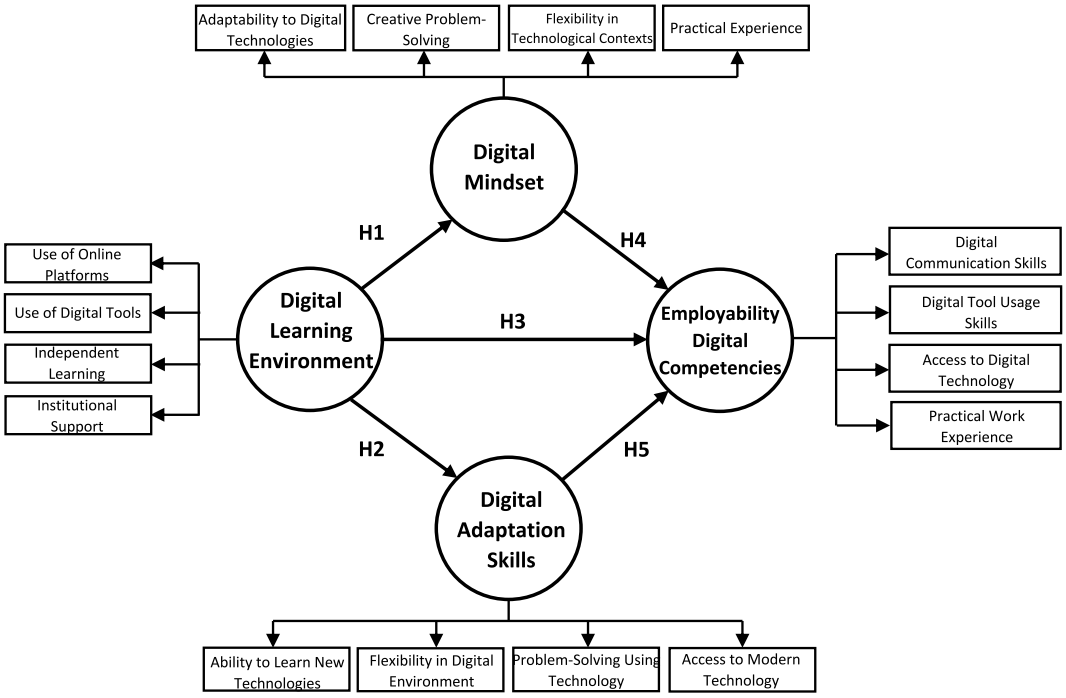


**Fig. 1.** Conceptual framework of the study. This model is an original contribution by the authors, developed through the integration of findings from Afzal et al. (2023), Suarta and Suwintana (2021), Audrin et al. (2024), and Potgieter et al. (2023).

study consisted of undergraduate business students in Thailand, aged between 18 and 25 years. Participants were enrolled in business-related programs such as management, accounting, and marketing at various higher education institutions. The inclusion criteria required students to be minimum currently enrolled in a bachelor's degree program and to have experience using digital tools and platforms as part of their academic learning process. This demographic group has grown up in the digital era and is generally familiar with digital technologies in their academic and professional activities. Furthermore, the data collection was conducted through an online questionnaire distributed via email and social media platforms to efficiently reach a broad target audience. The online survey was distributed using Google Forms and disseminated via email and widely used social media platforms, including WhatsApp, Facebook, and LINE, to reach Generation Z business students in Thailand. The questionnaire included brief definitions of each variable—Digital Learning Environment, Digital Mindset, Digital Adaptation Skills, and Employability Digital Competencies—to ensure respondents clearly understood the research constructs. In this regard, convenience sampling was employed to select participants due to the unknown exact size of the target population. Therefore, Cochran's formula was applied to calculate the appropriate sample size for this situation, yielding a minimum recommended sample size of approximately 384 respondents. In practice, 445 completed questionnaires were collected. All responses were analyzed to provide a comprehensive representation of Thai Generation Z business students.

### 3.2. *Measurement instrument*

The questionnaire consisted of five sections measuring key constructs: Digital Learning Environment (DLE), Digital Mindset (DM), Digital Adaptation Skills (DAS), and Employability Digital Competencies (EDC). Each construct was assessed using multiple items adapted from validated instruments in previous studies. All items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), ensuring consistency in response format across all constructs. To assess reliability, a pilot study was conducted with a sample of 30 respondents, and Cronbach's alpha coefficients were calculated. According to Hair et al. (2019), a Cronbach's Alpha value of 0.70 or higher is generally considered acceptable for demonstrating internal consistency reliability in social science research. The result of pilot study shows that overall, the Cronbach's alpha values ranged from 0.68 to 0.91, indicating acceptable to high reliability. Although one construct (Digital Mindset) had a slightly lower alpha value (0.68), it was retained due to the conceptual importance of the items, and its impact was carefully examined during the full data analysis. The analysis based on the complete dataset from all respondents revealed that most observed variables demonstrated strong to excellent reliability, with Cronbach's alpha values exceeding 0.70 and even surpassing 0.80 in several cases. Notably, the Digital Communication Skills construct recorded the highest reliability, with an alpha value of 0.903. However, a few variables—such as Independent Learning, Practical Experience with Digital Technologies, Ability to Learn New Technologies, and Access to Modern Technology—showed lower but still acceptable reliability levels, ranging from 0.607 to 0.664, in accordance with the threshold suggested by Hair et al. (2019). Although these variables remain suitable for analysis, their results should be interpreted with a degree of caution, as summarized in Table 3.

Additionally, the research addressed potential nonresponse bias by comparing responses between early and late respondents. The results indicated no statistically significant differences, confirming the absence of significant nonresponse bias. The questionnaire was distributed via email and online platforms, ensuring convenience in data collection and effectively protecting respondent confidentiality.

### 3.3. Data analysis methods

The data analysis commenced by examining the descriptive statistics for indicators associated with each primary construct, including Digital Learning Environment, Digital Mindset, Digital Adaptation Skills, and Employability Digital Competencies. Mean scores were categorized into five levels: lowest (0.00–1.00), low (1.01–2.00), moderate (2.01–3.00), high (3.01–4.00), and highest (4.01–5.00). The conceptual model was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). Evaluation of the measurement model was conducted using various criteria, including indicator loadings, internal consistency reliability, convergent validity, and discriminant validity.

For structural model assessment, the study examined collinearity statistics, coefficient of determination ($R^2$) to evaluate explanatory power, predictive relevance ($Q^2$), and utilized PLSpredict to assess predictive capabilities of the model (Hair et al., 2019). Finally, structural relationships among constructs were evaluated to test the research hypotheses formulated in this study.

## 4. Results

In an era where digital technology significantly influences education and employment, preparing prospective Generation Z businessmen to develop essential digital skills has become critical. This study aimed to explore the relationships among the digital learning environment, digital adaptation skills, and employability digital competencies among prospective Thai Generation Z businessmen, providing insights into the real-world context of this emerging student cohort.

Table 4 presents demographic characteristics of the sample group, comprising 445 Generation Z business students in Thailand. The majority of respondents were female (65.20 %, n = 290), while male respondents accounted for 34.80 % (n = 155). Regarding the type of educational institutions, most participants studied at public institutions (77.10 %, n = 343), with private institutions representing 22.90 % (n = 102). In terms of internship duration, the majority had completed internships lasting 3–5 months (59.80 %, n = 266), followed by those with 6–8 months (19.10 %, n = 85), whereas only 0.70 % (n = 3) reported internships lasting 9–11 months. Concerning fields of study, most respondents majored in Accounting (29.90 %, n = 133), followed by Marketing (14.60 %, n = 65), and

**Table 3**
Cronbach's Alpha values for observable variables in each construct.

| Construct | Observable variables | Cronbach's Alpha |
|---|---|---|
| Digital Learning Environment | Use of Online Platforms1 | 0.782 |
| | Use of Online Platforms2 | |
| | Use of Digital Tools1 | 0.789 |
| | Use of Digital Tools2 | |
| | Independent Learning1 | 0.607 |
| | Independent Learning2 | |
| | Institutional Support1 | 0.775 |
| | Institutional Support2 | |
| Digital Mindset | Adaptability to Digital Technologies1 | 0.772 |
| | Adaptability to Digital Technologies2 | |
| | Creative Problem-Solving1 | 0.753 |
| | Creative Problem-Solving2 | |
| | Flexibility in Technological Contexts1 | 0.790 |
| | Flexibility in Technological Contexts2 | |
| | Practical Experience1 | 0.652 |
| | Practical Experience2 | |
| Digital Adaptation Skills | Ability to Learn New Technologies1 | 0.625 |
| | Ability to Learn New Technologies2 | |
| | Flexibility in Digital Environment1 | 0.858 |
| | Flexibility in Digital Environment2 | |
| | Problem-Solving Using Technology1 | 0.752 |
| | Problem-Solving Using Technology2 | |
| | Access to Modern Technology1 | 0.664 |
| | Access to Modern Technology2 | |
| Employability Digital Competencies | Digital Communication Skills1 | 0.903 |
| | Digital Communication Skills2 | |
| | Digital Tool Usage Skills1 | 0.824 |
| | Digital Tool Usage Skills2 | |
| | Access to Digital Technology1 | 0.846 |
| | Access to Digital Technology2 | |
| | Practical Work Experience1 | 0.824 |
| | Practical Work Experience2 | |

Logistics Management (12.10 %, n = 54), with the fewest in Business Economics (0.20 %, n = 1). Finally, the GPA distribution indicated that most respondents achieved a GPA between 3.01 and 3.50 (42.70 %, n = 190), followed by 2.51–3.00 (29.00 %, n = 129), and the highest GPA range of 3.51–4.00 (20.00 %, n = 89), suggesting that the majority maintained academic performance from moderate to very good levels.

Overall, the results of the reliability and validity testing confirm that the measurement model meets the recommended thresholds. The strong Cronbach's alpha, composite reliability, and AVE values, along with acceptable factor loadings, indicate that the constructs are internally consistent and demonstrate sufficient convergent validity. These findings collectively validate the measurement model and provide a sound foundation for proceeding with the structural model analysis using PLS-SEM. More specifically, the analysis includes four latent variables: Digital Learning Environment (DLE), Digital Mindset (DM), Digital Adaptation Skills (DAS), and Employability Digital Competencies (EDC), each comprising four observable variables. According to Hair et al. (2019), CR values above 0.70, AVE values above 0.50, and VIF values below 5.0 are generally considered acceptable for establishing construct validity and assessing multicollinearity in PLS-SEM models. The results reveal that all factor loadings for observable variables exceeded 0.6, meeting the recommended threshold and indicating acceptable factor loadings. Variance Inflation Factor (VIF) values were below 5 for all variables, suggesting no issues with multicollinearity. Reliability assessments, measured by Cronbach's Alpha (α) and rho_A, ranged from 0.741 to 0.839, exceeding the acceptable minimum threshold of 0.7, thus demonstrating good internal consistency. Moreover, Composite Reliability (CR) values ranged from 0.838 to 0.891, and Average Variance Extracted (AVE) values ranged from 0.565 to 0.671, both surpassing the recommended thresholds (CR > 0.7 and AVE >0.5). These findings confirm that the questionnaire exhibits sufficient reliability and validity for use in this research (see Table 5).

Data analysis in this research was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the relationships and causal impacts among the variables, namely, Digital Learning Environment, Digital Mindset, and Digital Adaptation Skills, on Employability Digital Competencies of Generation Z business students in Thailand. The primary objective of this analysis was to test the hypotheses formulated in the conceptual model presented in Fig. 2.

Discriminant validity was assessed using the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. Following the recommendations of Hair et al. (2019), the square root of the AVE for each construct should be greater than its correlation with any other construct. Additionally, HTMT values below 0.90 indicate acceptable discriminant validity (Henseler et al., 2015). In this regards, Table 6 illustrates the results of discriminant validity analysis for the constructs used in this research, employing both the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT) to verify the distinctiveness among latent variables. According to the Fornell–Larcker criterion, the diagonal values (bolded) were found to be greater than all corresponding correlations between the

**Table 4**
Characteristics of the sample group.

| Measure and value | Frequency | Percentage |
|---|---|---|
| **1. Gender** | | |
| - Male | 155 | 34.80 |
| - Female | 290 | 65.20 |
| **2. Educational institution type** | | |
| - Public | 343 | 77.10 |
| - Private | 102 | 22.90 |
| **3. Internship duration** | | |
| - Less than 3 months | 80 | 18.00 |
| - 3–5 months | 266 | 59.80 |
| - 6–8 months | 85 | 19.10 |
| - 9–11 months | 3 | 0.70 |
| −12 months or more | 11 | 2.50 |
| **4. Current field of study** | | |
| - Modern Trade | 13 | 2.90 |
| - Modern Trade and Service Innovation | 3 | 0.70 |
| - Finance | 52 | 11.70 |
| - Management | 43 | 9.70 |
| - Human Resource Management | 42 | 9.40 |
| - Logistics Management | 54 | 12.10 |
| - Marketing | 65 | 14.60 |
| - Accounting | 133 | 29.90 |
| - Entrepreneurship | 39 | 8.80 |
| - Business Economics | 1 | 0.20 |
| **5. Current GPA** | | |
| −2.01–2.50 | 37 | 8.30 |
| −2.51–3.00 | 129 | 29.00 |
| −3.01–3.50 | 190 | 42.70 |
| −3.51–4.00 | 89 | 20.00 |
| **Total** | **445** | **100.00** |

Note: The demographic categories presented in Table 4, including GPA ranges and internship durations, were based on standard classifications commonly used by Thai higher education institutions. These intervals were selected to ensure consistency with institutional reporting formats and to improve the interpretability of the data in the local academic context.

**Table 5**
Reliability and validity test.

| Latent variables | Observable variables | Loading | VIF | α | rho_A | CR | AVE |
|---|---|---|---|---|---|---|---|
| Digital Learning Environment (DLE) | Use of Online Platforms (UOP) | 0.805 | 1.652 | 0.741 | 0.748 | 0.838 | 0.565 |
| | Use of Digital Tools (UDT) | 0.770 | 1.520 | | | | |
| | Independent Learning (IL) | 0.769 | 1.425 | | | | |
| | Institutional Support (IS) | 0.655 | 1.249 | | | | |
| Digital Mindset (DM) | Adaptability to Digital Technologies (ADT) | 0.749 | 1.517 | 0.802 | 0.804 | 0.871 | 0.628 |
| | Creative Problem-Solving (CPS) | 0.805 | 1.708 | | | | |
| | Flexibility in Technological Contexts (FTC) | 0.823 | 1.804 | | | | |
| | Practical Experience (PE) | 0.790 | 1.641 | | | | |
| Digital Adaptation Skills (DAS) | Ability to Learn New Technologies (ALNT) | 0.778 | 1.707 | 0.808 | 0.816 | 0.875 | 0.636 |
| | Flexibility in Digital Environment (FDE) | 0.852 | 2.033 | | | | |
| | Problem-Solving Using Technology (PUT) | 0.824 | 1.903 | | | | |
| | Access to Modern Technology (AMT) | 0.732 | 1.480 | | | | |
| Employability Digital Competencies (EDC) | Digital Communication Skills (DCS) | 0.839 | 1.928 | 0.837 | 0.839 | 0.891 | 0.671 |
| | Digital Tool Usage Skills (DTUS) | 0.815 | 1.776 | | | | |
| | Access to Digital Technology (ACDT) | 0.813 | 1.820 | | | | |
| | Practical Work Experience (PWE) | 0.810 | 1.826 | | | | |

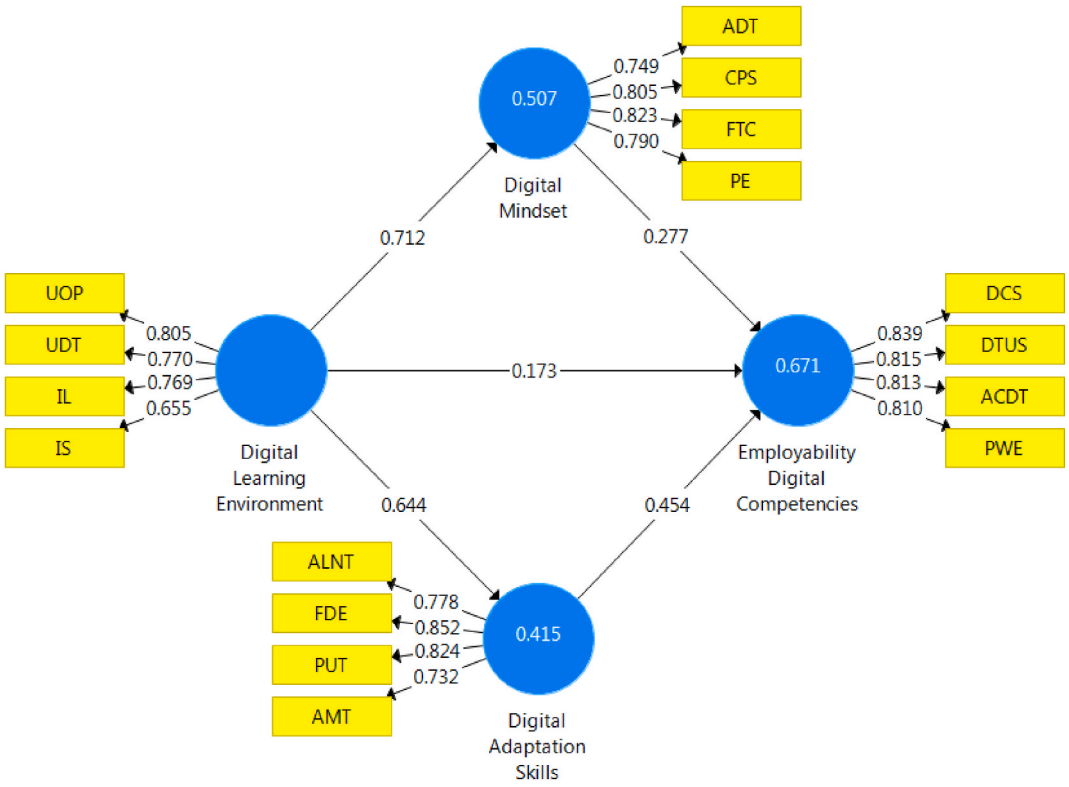


**Fig. 2.** Structural model for the study. Adapted from Afzal et al. (2023), Suarta and Suwintana (2021), Audrin et al. (2024), and Potgieter et al. (2023), with modifications made by the authors to fit the context of this study.

**Table 6**
Discriminant validity.

| Constructs | Fornell–Larcker criterion | | | | HTMT | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| **(1) DLE** | 0.752 | | | | | | | |
| **(2) DM** | 0.712 | 0.792 | | | 0.916 | | | |
| **(3) DAS** | 0.644 | 0.753 | 0.798 | | 0.830 | 0.932 | | |
| **(4) EDC** | 0.662 | 0.741 | 0.774 | 0.819 | 0.842 | 0.904 | 0.933 | |

other constructs, confirming adequate discriminant validity. Additionally, HTMT values were below the recommended threshold of 0.90 for most pairs of constructs, indicating acceptable discriminant validity. However, HTMT values for the pairs DM–DAS (0.932) and DAS–EDC (0.933) approached this threshold, suggesting relatively strong relationships but not significantly exceeding the recommended limit. Overall, these results support the discriminant validity of the constructs, demonstrating that each construct is sufficiently distinct to be appropriately used in structural model analysis.

Table 7 summarizes the results of structural hypothesis testing conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) t o explore the relationships among Digital Learning Environment (DLE), Digital Mindset (DM), Digital Adaptation Skills (DAS), and Employability Digital Competencies (EDC) among Thai Gen Z business students. *The interpretation of path coefficients and significance levels followed the guidelines provided by* Hair et al. (2019)*, with path coefficients greater than 0.10 considered meaningful, and p-values below 0.05 indicating statistical significance in structural equation modeling.* The analysis reveals that all proposed hypotheses were statistically supported (p-value = 0.000; significant at the 0.01 level). Specifically, DLE exhibited strong positive effects on DM ($\beta = 0.712$, $t = 22.500$) and DAS ($\beta = 0.644$, $t = 19.952$). Additionally, DLE demonstrated a significant but comparatively weaker direct positive influence on EDC ($\beta = 0.173$, $t = 4.081$). Meanwhile, DM ($\beta = 0.277$, $t = 5.731$) and DAS ($\beta = 0.454$, $t = 10.555$) significantly enhanced EDC. These findings underscore the importance of an effective digital learning environment in fostering students' digital mindset and adaptation skills, which ultimately contributes substantially to enhancing their digital competencies required for employment.

Moreover, Table 8 presents the results of the indirect relationship analysis, illustrating the mediating roles of Digital Mindset (DM) and Digital Adaptation Skills (DAS) in the relationship between Digital Learning Environment (DLE) and Employability Digital Competencies (EDC). The evaluation of mediation effects followed the approach recommended by Hair et al. (2019), using bootstrapping procedures with 5000 subsamples. An indirect effect was considered significant when the p-value was less than 0.05 and the t-value exceeded 1.96 (two-tailed test). The analysis confirms that both indirect paths are statistically significant at the 0.01 level. Specifically, the indirect effect of DLE on EDC through DM shows a path coefficient of 0.197 ($t = 5.563$, p-value = 0.000), while the indirect path through DAS yields a higher coefficient of 0.292 ($t = 9.384$, p-value = 0.000). These findings clearly indicate that Digital Adaptation Skills play a more critical role than Digital Mindset in amplifying the positive influence of Digital Learning Environment on Employability Digital Competencies. Nevertheless, both indirect pathways significantly contribute to understanding the complex relationships among the key constructs of this research.

## 5. Discussion

The findings of this study confirm a significant and positive relationship between the Digital Learning Environment (DLE) and Employability Digital Competencies (EDC) among Generation Z business students in Thailand. This aligns with prior research suggesting that technology-supported learning environments can enhance students' abilities in digital communication, collaboration, and tool usage—skills considered essential for navigating the modern workforce (Autthawuttikul et al., 2022; Vali, 2023). In particular, our study shows that DLE has a direct positive effect on EDC ($\beta = 0.271$, $p < 0.01$), indicating that exposure to structured, digitally enriched academic experiences strengthens students' job-relevant digital capabilities.

For Gen Z students—who are inherently accustomed to digital platforms—a supportive and resource-rich learning environment appears to further empower them to acquire and apply employability-related digital skills. This reinforces earlier findings that digital platforms and strong institutional support play a crucial role in preparing students for the expectations of a digitally-driven job market (Afzal et al., 2023; Thoma et al., 2019).

Beyond this direct effect, the study also highlights the mediating roles of Digital Mindset (DM) and Digital Adaptation Skills (DAS). Both variables significantly contributed to the development of EDC; however, the data revealed a stronger mediating effect from DAS ($\beta = 0.428$, $p < 0.001$) compared to DM ($\beta = 0.239$, $p < 0.05$). This suggests that while fostering an open and proactive digital mindset is important, students' capacity to flexibly adapt to new technologies has a greater influence on the development of competencies needed in the workforce. These findings emphasize the importance of building adaptive capacities that allow students to thrive amid rapid digital transformation, not just in mindset but also in tangible skill application (Martínez-Peláez et al., 2023; Vrana, 2016).

Taken together, these findings suggest that educational institutions and policymakers should not only invest in digital infrastructure but also prioritize cultivating students' digital adaptability and mindset. These internal capacities—especially digital adaptation—are critical for developing future-ready professionals who can confidently navigate change and continuously upskill in dynamic labor market environments (Imjai et al., 2024; Haleem et al., 2022).

While this study offers valuable insights, several limitations should be acknowledged. First, the survey was distributed primarily

**Table 7**
Summary results.

| Hypotheses | Effect | Path coefficients | Standard deviation | t-Statistic | p-Value | Results |
|---|---|---|---|---|---|---|
| H1 | DLE - > DM | 0.712 | 0.032 | 22.500 | 0.000 | Supported |
| H2 | DLE - > DAS | 0.644 | 0.032 | 19.952 | 0.000 | Supported |
| H3 | DLE - > EDC | 0.173 | 0.042 | 4.081 | 0.000 | Supported |
| H4 | DM - > EDC | 0.277 | 0.048 | 5.731 | 0.000 | Supported |
| H5 | DAS - > EDC | 0.454 | 0.043 | 10.555 | 0.000 | Supported |

Note: **Significant at 0.01.

**Table 8**
Indirect relationship.

| Indirect effect | Path coefficients | Standard deviation | t-Statistic | p-Value |
|---|---|---|---|---|
| DLE - > DM - > EDC | 0.197 | 0.035 | 5.563 | 0.000 |
| DLE - > DAS - > EDC | 0.292 | 0.031 | 9.384 | 0.000 |

Note: **Significant at 0.01.

through social media, which may introduce sampling bias. Because participants were self-selected, the sample may not fully represent the broader population of business students in Thailand. Second, the data were collected through self-reported questionnaires, which raises the possibility of response bias—some students may have rated their digital competencies more positively than they actually are. Lastly, although the reliability values for most constructs were acceptable, a few Cronbach's alpha scores were close to the lower threshold of 0.70. This suggests that some measurement items could benefit from further refinement in future studies.

### *5.1. Approaches to developing students for the digital labor market*

Transforming Thai educational institutions to accommodate modern learning paradigms has become an essential consideration in the current digital era, as rapid technological advancements have significantly reshaped economic and social environments (Haleem et al., 2022). Educational institutions must therefore adapt their pedagogical approaches to align with this evolving context, emphasizing the development of digital competencies essential for future labor markets. Providing students with access to cutting-edge technologies and digital tools, including online learning platforms, specialized applications, and industry-specific software, is critical in preparing students to be competitive within the continually evolving job market (Afzal et al., 2023; Thoma et al., 2019). Furthermore, creating learning environments that cultivate a robust digital mindset and adaptability towards emerging technologies will enable students to effectively apply their knowledge in real-world situations (Costa et al., 2023; Imjai et al., 2024). These strategies not only benefit individual students as future professionals but also contribute significantly to enhancing Thailand's overall competitiveness in the global digital landscape.

### *5.2. Enhancing digital skills for the next generation of students: preparing for the future*

Equipping the new generation of students with appropriate digital skills is crucial in an era where technology plays a significant role across all industries. Educational institutions should prioritize curriculum design that emphasizes experiential learning, enabling students to gain practical experience with digital tools and technologies aligned with labor market demands, such as digital communication platforms, data analysis software, and online project management tools (Adeshina, 2024; Siddoo et al., 2019). Additionally, cultivating essential 21st-century skills—including critical thinking and creative problem-solving—through the practical application of digital technology will better prepare students to adapt to new technological developments (Costa et al., 2023; Goulart et al., 2022).

Furthermore, promoting lifelong learning is equally critical. Institutions should foster a growth mindset among students, encouraging continuous adaptation to evolving technologies through skill-enhancement training, challenging real-world activities, or industry collaborations involving digitally focused internships (Mendoza-Villafaina & López-Mosquera, 2024; Poláková et al., 2023). Providing up-to-date and adequate technological resources will further support students in effectively developing essential digital competencies. Collectively, these efforts will ensure that the new generation of students is genuinely prepared to succeed in the future digital workforce (Timotheou et al., 2023; Haleem et al., 2022).

### *5.3. Practical implications*

The findings of this study offer valuable insights for designing educational curricula in Thai higher education institutions, specifically aimed at aligning student competencies with the demands of the digital labor market. Educational institutions should enhance their role by providing supportive digital learning environments that facilitate independent learning via modern online platforms and digital tools. Furthermore, institutions should prioritize cultivating students' digital mindsets by offering practical problem-solving opportunities and encouraging internships or project-based learning involving digital technologies, effectively developing students' employability digital competencies.

### *5.4. Limitations and future research directions*

Despite the robust statistical findings, this research has certain limitations. First, the convenience sampling approach limits the generalizability of the results, as the findings may not represent the broader student population. Additionally, relying primarily on online questionnaires may introduce response bias or incomplete data. Furthermore, some observed variables exhibited Cronbach's alpha coefficients below the recommended threshold of 0.7, indicating potential reliability concerns, necessitating cautious interpretation of those variables.

Future research should address these limitations by employing larger, more representative samples from diverse academic disciplines and educational institutions, both public and private, to enhance the generalizability of findings. Incorporating qualitative

methodologies, such as in-depth interviews or case studies, could further deepen understanding of how students develop digital competencies. Moreover, exploring additional relevant factors, such as the role of instructors or support from industry partners, would enrich the findings and increase their applicability to educational and workforce development strategies in the digital age.

## 6. Conclusion

This study confirms that digital learning environments significantly influence employability digital competencies among Generation Z business students in Thailand, both directly and indirectly through digital mindset and digital adaptation skills. *The findings demonstrate that while both Digital Mindset (DM) and Digital Adaptation Skills (DAS) serve as mediators in the relationship between digital learning environments and employability digital competencies, their impact differs in magnitude. Specifically, DAS exhibited a stronger mediating effect, with a higher indirect path coefficient ($\beta = 0.292$, $p < 0.001$) compared to DM ($\beta = 0.197$, $p < 0.001$). This suggests that students' ability to adapt and respond flexibly to digital tools plays a more central role in enhancing employability than mindset alone. As such, higher education institutions should place greater emphasis on developing adaptive skills alongside cultivating a forward-looking digital mindset.* Enhancing digital mindset and adaptation skills through well-designed learning environments can strategically align higher education curricula with labor market expectations. Specifically, when educational institutions establish comprehensive digital learning environments characterized by flexibility, adequate technological resources, and robust infrastructure, students are more inclined to develop an adaptive mindset toward emerging technologies and adjust effectively to evolving digital contexts. The results also imply that, to enhance employability, educational policies should emphasize not only digital access but also pedagogical strategies that foster adaptive digital mindsets and broad-based digital skills among learners. These attributes, in turn, support the development of critical digital competencies essential for success in contemporary workplaces. Consequently, the findings offer practical guidance for educational institutions in designing curricula and learning support systems that more effectively align student competencies with the evolving demands of the digital labor market.

## CRediT authorship contribution statement

**Narinthon Imjai:** Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Formal analysis, Conceptualization. **Suchart Chansamran:** Writing – original draft, Visualization, Software, Methodology, Formal analysis, Conceptualization. **Sirinthra Sungthong:** Writing – review & editing, Visualization, Resources, Investigation, Data curation. **Berto Usman:** Writing – review & editing, Visualization, Validation, Investigation. **Somnuk Aujirapongpan:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

## Ethics declaration

Authors declared that the participants were assured that their participation is voluntary and that they can withdraw from the study at any time. The data collected from the participants was kept confidential and anonymous, and the data was only be used for research purposes. Authors further declared that the study complied with ethical guidelines set forth by the Institutional Review Board of the human research ethics committee of Walailak University (WUEC-24-369-01), Thailand.

## Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to assist with improving the readability and language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

## Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Data availability

Data will be made available on request.

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