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Journal of Social Studies Education Research

Sosyal Bilgiler Eğitimi Araştırmaları Dergisi

2026:17 (2), 145-170

Digital Intelligence Quotient and Self-Efficacy: The Impact of Technology Readiness and Training Compatibility in Vietnam

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Abstract

Given the significant digital transformation in Vietnam and around the world, Digital Intelligence Quotient (DQ) is becoming increasingly crucial for students to meet the demands of the modern learning and working environment. This study aims to examine the effect of DQ on Vietnamese students' self-efficacy, mediated by technological readiness and the training program's suitability. Data were collected from 912 students at the University of Economics Ho Chi Minh City (UEH) through the online survey platform of Singapore's DQ Institute to ensure objectivity and high reliability. Using partial least squares structural equation modeling (PLS-SEM), the results indicated that DQ positively impacts students' technology readiness and self-efficacy. Additionally, the association between DQ and self-efficacy is mediated by technology readiness and moderated by training program suitability. These findings emphasize the importance of developing digital training programs for key universities, such as UEH in Vietnam, to help students improve their academic performance and strengthen their competitive edge in the global labor market. The study advances the Digital Intelligence theory and offers practical recommendations for Vietnamese educational institutions and businesses in developing digital skill programs.

Keywords: *Digital Intelligence, Technology Readiness, Self-Efficacy, Training Program Suitability, Vietnam*

Introduction

In today's digital age, the rapid pace of technological progress has significantly changed how humans interact, think, and understand emotions. While traditional measures of intelligence, such as intelligence quotient (IQ) and emotional intelligence (EQ), have long been seen as crucial for

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success both personally and professionally, the growing dependence on digital tools emphasizes the need for a new measure: digital intelligence quotient (DQ) (Marnewick & Marnewick, 2021).

DQ demonstrates a comprehensive understanding of the social and emotional competencies and knowledge required to navigate the digital realm effectively. As DQ plays a crucial role in engaging with the digital society (Wannapiroon & Wattananaiya, 2018), it represents a foundational skill set for the 21st century. The necessity of studying DQ becomes evident when considering its multifaceted impacts on human life, from fostering responsible digital citizenship to enhancing employability in technology-driven industries. As the Fourth Industrial Revolution advances and our lives become more connected, the health and prosperity of societies worldwide will depend on it (World Economic Forum, 2018). According to Park (2019), human beings need to master digital skills in the current digital revolution, and these skills are even more important than physical skills. However, research on DQ remains limited (Na-Nan et al., 2020), particularly in developing countries like Vietnam, where digital transformation is accelerating but is often accompanied by uneven access to resources and education. A recent study by Cho et al. (2018) emphasizes the need for further research in digital intelligence due to its importance for humans, education, and the economy. This gap underscores the urgent need for academic exploration of DQ, especially its influence on individual abilities and societal outcomes.

While IQ was once a key factor affecting professional performance and learning ability, DQ is now more crucial in the realm of digital technologies. Someone with a high DQ can easily adapt to digital tools, perform well in an online setting, and make decisions based on facts, but someone with a high IQ and low DQ might struggle to use technology at work (Martin, 2006). This presents a significant challenge for institutions and businesses: How can they enhance digital intelligence for students and employees to align with the demands of the digital labor market?

This study aims to clarify the role of DQ in preparing students for the digital workforce by examining the correlations among DQ, technology readiness, training program suitability, and self-efficacy at the University of Economics Ho Chi Minh City (UEH) in Vietnam. The present investigation employs a single-site case-study design for two principal reasons. First, the variables identified above are intimately connected to curriculum development, pedagogical practice, the

learning environment, and the cultivation of students' digital competencies. Consequently, insights derived from one institution can be adapted and scaled across the Vietnamese higher-education sector. Second, UEH is an academically rich site. Recognized as a national key university, UEH pursues a multidisciplinary, sustainability-focused mission and is ranked in the 301+ band of the QS Asia University Rankings 2024. The university has produced thousands of officials, economists, and managers at both undergraduate and postgraduate levels, and currently enrolls more than 35,000 students from all regions of Vietnam.

A focused inquiry into DQ within this setting is therefore both timely and significant: it will (i) advance theoretical understandings of DQ in higher education and (ii) establish an empirical foundation upon which other Vietnamese universities can develop context-specific strategies for integrating DQ into teaching and learning. Accordingly, our current study is guided by the following research questions:

1. How does DQ influence students' self-efficacy in Vietnam: a case study in UEH?
2. What role does technology readiness play in mediating the relationship between DQ and self-efficacy?
3. How does the suitability of training programs moderate the impact of DQ on self-efficacy?

This study's distinguishing characteristic is the use of the DQ Index from the DQ Institute Singapore, a methodical, objective, and highly reliable assessment tool. This helps the research show a realistic, scientific, and very relevant point of view. It also gives companies and institutions useful ideas for building digital training and development programs for their employees. The research results advance the DQ literature and have important practical implications for improving the quality of education, training, and human resource recruitment in the digital age.

The rest of the paper is organized as follows. 'Literature Review' develops the hypotheses. 'Data and Methodology' explains the study methods and data collection procedures. 'Results' outlines the findings of the analysis. 'Discussion' and 'Implications' describe, respectively, the study's findings and its theoretical and practical implications. The paper ends with 'Conclusions and Recommendations'.

Literature review

DQ and self-efficacy

DQ is a comprehensive set of competencies that encompasses technical, cognitive, metacognitive, and social-emotional skills, grounded in universal ethical values. It helps individuals face the challenges of digital life and adapt to the demands of the digital environment (DQ Institute, 2023). DQ is not limited to technological skills; it also includes digital cognition, information security literacy, technology ethics, and, especially, the ability to interact and communicate in the digital environment. This helps individuals become competent "digital citizens", ready for the future, and able to use, control, and create technology to support humanity's development (DQ Institute, 2019). The IEEE DQ Global Standards (IEEE3527.1TM) are based on a comprehensive competency framework developed by the DQ Institute in collaboration with international organizations, including the OECD, IEEE, and the World Economic Forum (WEF). The DQ Framework encompasses eight domains: (1) Digital Identity: managing self-image in the digital environment; (2) Digital Use: balancing online and offline life; (3) Digital Safety: managing and reducing online risks; (4) Digital Security: protecting personal data and devices from cyber threats; (5) Digital Emotional Intelligence: recognizing and regulating emotions during online interactions; (6) Digital Communication: using technology effectively for communication and collaboration; (7) Digital Literacy: responsibly evaluating, synthesizing, and creating digital content; (8) Digital Rights: understanding and exercising your rights in the digital environment.

The DQ Assessment is a globally standardized measurement tool that offers many outstanding benefits in assessing digital competencies. This tool enables objective, accurate assessment of the digital competencies of different target groups and helps compare them across geographic areas and learning and working conditions. In addition, the DQ Assessment provides reliable data to help educational institutions and businesses build effective digital training and development programs. The 2019 Global Standards Report on DQ states that using the DQ Assessment not only helps identify people's digital skills but also supports the development of soft skills such as adaptability, critical thinking, and adherence to digital ethics (DQ Institute, 2019). Unlike traditional assessment tools that focus only on "digital skills", the DQ Assessment provides a more comprehensive view by assessing digital knowledge, skills, attitudes, and ethical values. This comprehensive approach helps the study create a complete picture of digital competencies, thereby

providing valuable recommendations for universities and businesses in improving digital competencies for students and employees. The use of the DQ Assessment in this study not only ensures the objectivity and high reliability of the research results but also facilitates the study's broad applicability and ease of comparison across different target groups. This is an important step forward in developing digital training programs and human resource development strategies, while contributing to improving the quality of education and recruitment efficiency in the digital age.

Self-efficacy is defined as an individual's belief in their ability to organize and execute the actions necessary to achieve desired outcomes (Bandura, 1986). According to Shen et al. (2013), self-efficacy plays an important role in learning and performance because people with high self-efficacy tend to set more challenging goals and persevere to achieve them. Individuals with high DQ tend to feel comfortable and confident using digital tools, which boosts their sense of control and mastery over digital tasks. This aligns with the concept of self-efficacy, where beliefs about one's ability to finish tasks lead to better performance (Asanre & Chinaka,2024; Ganefri et al., 2024; Makeleni et al., 2023; Martin, 2006).

In addition, digital literacy, an important aspect of DQ, is not merely the ability to use technology but also to evaluate, analyze, and apply digital information effectively. When students feel highly digitally competent, they are more confident in online learning, digital research, and technology-related activities, thereby promoting their self-efficacy. In addition, digital emotional intelligence plays an important role in managing emotions in digital environments, helping individuals handle stressful and conflicting situations in online communication, maintain a positive spirit, and remain steadfast in achieving learning and work goals (Cho et al., 2018). Not only that, when individuals have a good understanding of digital security and safety, they will be less affected by cyber threats, helping minimize distraction and anxiety, and creating favorable conditions for them to focus on tasks and improve self-efficacy. High DQ helps individuals leverage online learning tools, participate in digital courses, and develop soft skills on online platforms. Making small achievements in the process of learning and working digitally will create a positive feedback loop, helping them enhance their self-efficacy sustainably (Wannapiroon & Wattananaiya, 2018).

From the above arguments, it can be affirmed that DQ positively impacts students' self-efficacy, helping them become more confident in learning and development in a digital environment.

H1: Digital Intelligence (DQ) has a positive impact on students' self-efficacy.

The mediating role of technology readiness

Technology readiness (TR) refers to an individual's tendency to accept and use new technologies to achieve goals in a personal or professional context (Parasuraman, 2000). This concept reflects a general psychology shaped by positive and negative factors that influence users' readiness to adopt new technologies (Parasuraman, 2000). According to Lai (2008), perceptions of a technology often include both positive and negative aspects, thereby determining the level of individual readiness in accepting that technology. Positive perceptions help motivate individuals towards adopting new technologies, while negative perceptions can create barriers and reduce motivation to engage with technology (Parasuraman & Colby, 2015).

In addition, self-efficacy is defined as an individual's belief in their ability to learn and achieve desired learning outcomes (Lekhu, 2023; Mokone & Setlalentoa, 2023; Sekerbayeva et al., 2023; Shen et al., 2013). Technology readiness (TR) serves as an important bridge between DQ and self-efficacy, as high DQ helps individuals develop positive perceptions of technology, thereby promoting self-confidence and improving self-efficacy when approaching digital tasks.

H2: Technology readiness (TR) plays a mediating role in the relationship between Digital Intelligence (DQ) and students' self-efficacy.

The moderating role of training program suitability

Gangwar et al. (2015) suggest that effective training programs can reduce individual anxiety and stress when learning new and complex technologies, while also increasing motivation and providing a clearer understanding of the benefits of technology for work tasks. Creating appropriate training programs can not only help students boost their self-efficacy but also strengthen the positive influence of Digital Intelligence (DQ) on self-efficacy.

When students are exposed to training programs tailored to their level and practical needs, they will feel more confident applying digital technologies to their studies and work. This helps to unleash the potential of DQ, turning digital knowledge and skills into a strong belief in their ability to complete digital tasks. This relationship indicates that DQ can influence self-efficacy only to the maximum extent when students receive appropriate training programs that reduce psychological barriers and enhance learning performance. Therefore, we propose the hypothesis as follows:

H3: The appropriateness of the training program has a direct and positive impact on students' self-efficacy, and the relationship between Digital Intelligence (DQ) and self-efficacy will be enhanced when students are provided with appropriate digital training programs.

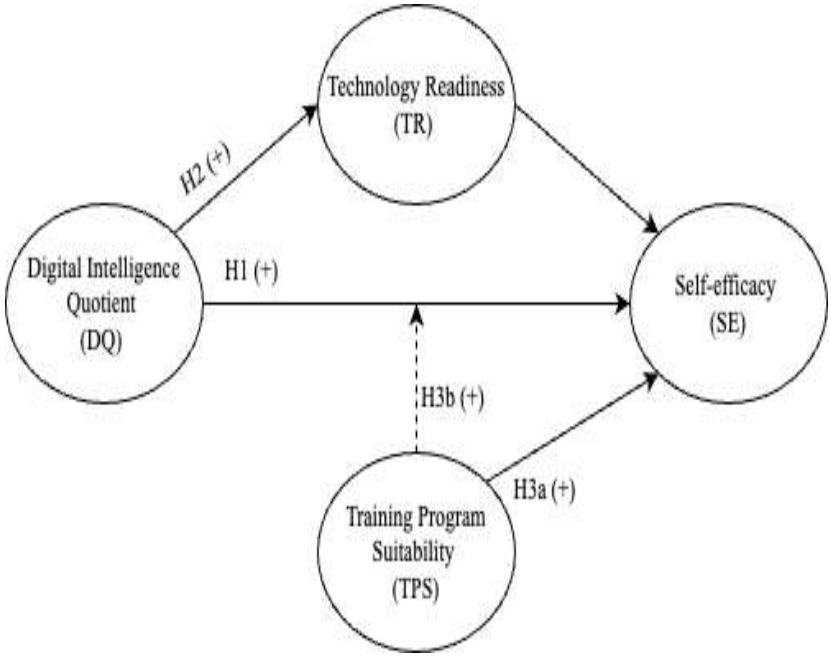

Figure 1. Conceptual Model, Data, and Methodology

The Necessity of Research in the Context of Vietnam

In the context of Vietnam advancing the digital transformation process in all spheres, from education and economy to social governance, enhancing DQ for students - future human resources - has become a crucial requirement. With a vision to 2030 set by the Vietnamese government, the National Digital Transformation Program to 2025 identifies education and training as a priority sector, aiming to produce a workforce that can quickly adapt to changes in the digital age. Although many universities in Vietnam have actively implemented online learning programs and applied digital technology to teaching, empirical studies on the relationship between DQ and students' self-efficacy remain limited. Moreover, factors such as technology readiness and the suitability of training programs have not been fully evaluated in the context of Vietnam's specific culture and educational system. This study not only contributes to the global body of knowledge on DQ but also offers practical suggestions for Vietnamese businesses and educational institutions to develop successful digital training initiatives. Understanding how DQ influences the self-efficacy of

Vietnamese students will enable employers and educational managers to design appropriate digital skills development and training programs, thereby enhancing the quality of human resources and supporting Vietnam's international integration and sustainable economic development in the digital age.

Method

Research Design

The quantitative research design was employed. The proposed research model examines the relationships among Digital Intelligence Quotient (DQ), technology readiness, training program suitability, and students' self-efficacy. Specifically, the model includes the mediating role of technology readiness and the moderating role of training program suitability. The initial bilingual (English–Vietnamese) questionnaire for these constructs was evaluated by 10 experts, including 5 industry and 5 academic experts. These experts, knowledgeable in the study's domain, provided feedback that was incorporated into the survey. After modifications, all experts reached a consensus that the measurement items were appropriate. Details of all survey items are presented in Appendix A. After adjustments based on expert feedback, the questionnaire was translated back and forth (Brislin, 1980) to ensure accuracy in language and content. To operationalize concepts and constructs, we used a 5-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). This method is widely accepted in empirical research, especially when established measures for quantifying abstract constructs such as resources and capabilities are unavailable (Kumar et al., 1993). The relationships among the constructs were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0, which is suitable for analyzing complex models involving mediation and moderation relationships.

Participants

The target population of this study consists of full-time undergraduate students at the University of Economics Ho Chi Minh City (UEH). The University of Economics Ho Chi Minh City is one of Vietnam's key universities. According to the QS Asia 2024 rankings, UEH ranked in the Top 301+ among the Best Universities in Asia. In particular, UEH has trained thousands of officials, economists, and managers across the country with undergraduate and postgraduate degrees (UEH, 2025). So samples from UEH ensure representation when we study DQ in Vietnam. This university was chosen for its reputation and implementation of pilot schemes for Digital Intelligence by the Vietnamese Ministry of Education and Training.

We sent out 1,000 survey invitations to full-time students at UEH through the university's official email. Participants were selected using a non-probability convenience sampling approach based on voluntary participation. Students received a unique access code to take part in the survey on the DQ platform, which helps ensure data confidentiality and standardization. The DQ Institute managed the entire data collection process, from providing the online platform to processing the raw data. After the survey was completed, they analyzed the data using the DQ Analytics Dashboard and returned the complete dataset, including DQ scores and other variables, to us.

After the closure of the survey, 982 responses were received, of which 912 complete responses were included in our analysis. To assess potential non-response bias, mailing list respondent profiles were used to compare gender and education level between responding and non-responding students. Chi-square tests were performed using SPSS version 20.0, with a significance level of $p < 0.05$. The results showed no statistically significant differences between the two groups for these characteristics, suggesting that non-response bias was not a concern in this study.

Table 1 presents the demographic characteristics of the survey participants. Among the respondents, 670 (73.5%) were female, and 242 (26.5%) were male, reflecting the gender distribution commonly observed among students in economics-related programs in Vietnam, where women constitute the majority. Regarding academic standing, 38.2% of the participants were first-year students, 33.2% were sophomores, and 28.6% were juniors.

Table 1

Sample distribution

	Quantity	%
Gender		
Male	242	26.5
Female	670	73.5
Education level		
Freshmen	348	38.2
Sophomores	303	33.2
Juniors	261	28.6
Total	912	100.0

Data Collection Tools

The study used four main measurement scales, including Digital Intelligence Quotient (DQ), Technology Readiness, Self-Efficacy, and Training Program Suitability. These measurement tools were selected from highly reliable studies and adapted to the research context in Vietnam. The DQ Institute developed the DQ measurement questionnaire, which covers key areas such as digital literacy, digital safety, digital communication, and digital emotional intelligence. The DQ Institute sent this questionnaire to us for localization, ensuring its suitability for the local culture and language and making it easy for students to access and complete the survey. The variables technology readiness, self-efficacy, and training program suitability were built on previous studies by Damerji & Salimi (2021), Adeyemo (2007), and Gangwar et al. (2015).

The DQ Institute has created our online survey using its existing fee-based platform, the DQ Assessment (dqassessment.com), which allows individuals to self-evaluate their digital skills and compare their scores with national, regional, and global averages. Building on this framework, the DQ Institute has developed a new Vietnamese-language version that includes its original set of questions for measuring DQ and adds another set to evaluate other important variables. In partnership with UEH, students now have free access to this upgraded platform via a unique login code, ensuring both security and ease of access.

Data Analysis techniques

To evaluate the potential for non-response bias, the profiles of individuals in the original mailing list were utilized to compare key demographic characteristics—specifically gender and educational level—between respondents and non-respondents. Chi-square tests were conducted using SPSS version 20.0, with the significance threshold set at $p < 0.05$. The findings revealed no statistically significant differences between the two groups across these characteristics, indicating that non-response bias is unlikely to pose a threat to the validity of the study. Moreover, the data were analyzed in accordance with the guidelines proposed by Hair et al. (2022), employing the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach using SmartPLS version 4.0. The analysis followed a two-step procedure, including the evaluation of the measurement model and the assessment of the structural model. The measurement model was examined in terms

of reliability and validity, while the structural model was evaluated using path coefficients and bootstrapping procedures to test the proposed hypotheses.

Findings

Measurement results

This section outlines the findings from the data analysis of the measurement model, with an emphasis on reliability and validity. The analysis includes: (1) assessing item loadings and internal consistency reliability, (2) evaluating convergent validity, and (3) examining discriminant validity[2] (Hair et al., 2022).

Table 2 shows the description of all survey items and their corresponding loadings. All loadings exceed the recommended threshold of 0.70, indicating strong consistency among the indicators and aligning with internal reliability standards. Consistent with Hair et al. (2022), Composite Reliability (CR) was used to assess internal consistency. The results show that all CR values surpass the recommended benchmark of 0.70, confirming robust internal consistency.

Table 2

Variable description and evaluation

	Loading	t-statistic
Technological Readiness (AVE = 0.58, CR = 0.82)		
● TR1	0.81	55.54
● TR2	0.80	38.99
● TR3	0.83	56.80
● TR4	0.69	24.79
● TR5	0.67	22.96
Self-efficacy (AVE = 0.51, CR = 0.81)	0.71	31.03
● SE10	0.70	29.11
● SE11	0.70	31.03
● SE12	0.74	41.65
● SE16	0.73	39.26
● SE17	0.72	32.12
● SE9	0.81	55.54
Training Program Suitability (AVE = 0.68, CR = 0.76)		
● TPS1	0.75	28.17
● TPS2	0.85	61.29
● TPS3	0.86	67.24

[2] *We also estimate Cronbach's alpha of each construct (construct reliability test) to assess whether identified constructs are consistent. Untabulated results indicate that the Cronbach's alpha of each construct is more than 0.6, confirming that our constructs are reliable.*

Convergent validity assesses how well assessments of similar or identical constructs are positively correlated, supporting construct validity. When evaluating convergent validity, the Average Variance Extracted (AVE) is reported. In this analysis, all AVE values range from 0.51 to 0.68, surpassing the recommended threshold of 0.50, which indicates satisfactory convergent validity.

Discriminant validity evaluates the extent to which a construct is distinct from other constructs (Hair et al., 2022). This study uses the Fornell and Larcker (1981) criteria for assessment. In Table 3, the square root of the AVE scores (ranging from 0.72 to 0.97) exceeds all corresponding bootstrapped correlation coefficients, and most correlation coefficients are below the cut-off value of 0.7 (Tabachnick et al., 2013). These results confirm satisfactory discriminant validity.

Table 3

Discriminant values according to the Fornell-Larcker criterion among variables related to self-efficacy

		[1]	[2]	[3]	[4]
DQ	[1]	1.00			
SE	[2]	0.23	0.72		
TR	[3]	0.31	0.55	0.76	
TPS	[4]	0.13	0.53	0.48	0.82

Notes: DQ: Digital Intelligent Quotient; SE: Self-efficacy; TR: Technological Readiness; TPS: Training Program Suitability

In this study, potential issues related to common method bias were considered, as the research relies on self-reported data (Podsakoff et al., 2003). To evaluate the extent of common method variance, a Harman's single-factor test was performed. The results show that the first factor explained 38.63% of the total variance, indicating that no single factor dominates. Additionally, a common method factor was incorporated into the model to address common method bias further. Results are presented in Appendix B. We also assess multicollinearity by calculating the Variance Inflation Factor (VIF). The results indicate that the VIF values in this study range from 1.19 to 1.86, all of which are well below the threshold of 10. Therefore, multicollinearity is not a concern in this study.

Structural results

The assessment of the structural model follows the guidelines of Hair et al. (2022). We employ the PLS-SEM approach, which is known to have higher statistical power than Covariance-Based Structural Equation Modeling (CM-SEM) under similar conditions (Reinartz et al., 2009). The path coefficients between endogenous and exogenous constructs are estimated using 500 subsampling iterations via the bootstrap method. The SRMR indicator provides a goodness-of-fit estimate of 0.05, which is below the recommended threshold of 0.08 (Henseler et al., 2016), indicating an acceptable model fit. The adjusted R^2 values range from 0.29 to 0.41, surpassing the 0.10 threshold, indicating that the predictors account for a significant portion of the variance in the dependent variable, and the variances are within a reasonable range.

In Appendix C, the coefficients of DQ are positive and significant at the 1% level in columns 1 and 3 ($\beta = 0.07$, $p < 0.05$). These findings support H1, showing that DQ positively influences students' self-efficacy. These findings align with previous research from Prior et al. (2016) about the significant influence of digital literacy on self-efficacy. Since DQ involves understanding how to use digital technologies effectively to achieve outcomes, students with high DQ are capable of adapting to digital transformation. Accordingly, these students may possess self-efficacy, which involves "students' judgments of their capabilities to organize and execute a course of action required to attain designated types of performances" (Prior et al., 2016).

The coefficients of DQ are significantly positive in columns 2 and 4, providing evidence supporting H2, which posits that DQ positively influences students' technology readiness. Technology readiness is defined as people's propensity to embrace and use new technologies to accomplish work goals (Parasuraman, 2000). Recently, Damerji and Salimi (2021) observed a positive correlation between technology readiness and students' adoption of new technology. When students have opportunities to interact and work within a well-supported infrastructure, they are more likely to develop positive attitudes and confidence in using new technology and in their ability to succeed at tasks. As such, DQ can significantly influence students' technology readiness. To test H3, we include training program suitability (STP) and its interaction term with Digital Intelligence quotient (STP*DQ) in the regressions. Appendix C shows that the coefficients for STP and STP*DQ are positive and significant. These results suggest that training program

suitability is directly and positively associated with students' self-efficacy, and the relationship between Digital Intelligence quotient and self-efficacy is exacerbated when students are provided suitable training programs in digital technologies. This finding aligns with the findings of Gangwar et al. (2015), which show that suitable training programs can reduce an individual's anxiety and stress about using a new and complex technology and provide motivation and a better understanding of its benefits for their tasks.

Discussion

The existing literature has explored the key areas of DQ and how digital skills are measured. However, little is known about the important role DQ might play in promoting self-efficacy in higher education. The current study investigates a DQ model of self-efficacy within the university context. Based on signaling theory, we propose that DQ could boost self-efficacy through the mediating effect of technology readiness and the moderating influence of training programs.

The findings of this study confirm that DQ positively impacts students' self-efficacy, with technology readiness as a mediator and training program suitability as a moderator. These results reinforce the growing importance of DQ in higher education and workforce preparation. The results further support the findings of Cho et al. (2018), who argued that DQ can help individuals develop strong knowledge of DQ, such as security and safety, to address issues and achieve work and learning objectives. Our results also extend prior studies by Shen et al. (2013) and Martin (2006), who found that individuals with high DQ tend to feel confident when using digital tools to accomplish tasks, based on their beliefs. Moreover, through the full mediating effect, we emphasize the importance of technology readiness, resulting from DQ capability, in fostering self-efficacy.

In addition, the current study confirms that the training program plays a moderating role in the relationship between DQ and self-efficacy. It means that the more training programs an individual receives in the workplace or in higher education, the greater their belief in achieving higher performance. This result seems consistent with a prior study that found a relationship between training and self-efficacy (Gangwar et al., 2015). Although these findings are compelling, it is necessary to critically engage with potential alternative explanations and limitations in applying these results beyond the specific sample.

Another explanation is that students who already have higher levels of self-efficacy may be more likely to develop their DQ, rather than DQ directly influencing self-efficacy. Due to the study's cross-sectional design, this reciprocal relationship is not fully explored. Therefore, to better understand whether DQ promotes self-efficacy over time or whether pre-existing self-efficacy levels affect DQ development, future research could use a longitudinal study to provide deeper insights.

In addition, socioeconomic background, prior exposure to technology, and institutional support systems can be considered as external factors that may have influenced students' self-efficacy and technology readiness. Apart from the study's controls for training program suitability, considering additional contextual variables could further clarify DQ's influence. Moreover, the methodology in this study may introduce bias, as respondents may overestimate or underestimate their digital competencies based on subjective perceptions rather than actual proficiency. Therefore, incorporating a mixed-method approach or performance - based assessments like interviews or case studies in order to avoid the above-mentioned.

Additionally, although this study highlights a significant moderating effect of training program suitability, it does not investigate the specific features that make digital training programs effective. Future research should examine which training approaches—such as experiential learning, gamification, or mentorship programs—have the greatest impact on boosting self-efficacy by developing Digital Intelligence.

Our findings support previous ideas of digital intelligence as a multifaceted concept that includes technical, cognitive, and socio-emotional skills (Park, 2019; DQ Institute, 2018). These findings align with earlier models of digital competence and literacy that highlight the importance of skills in navigating digital environments (Carretero et al., 2017; Martin, 2006; Vuorikari et al., 2022). Moreover, our study extends the existing literature (van Laar et al., 2020; Spante et al., 2018) by highlighting the role of digital intelligence quotient as an integrated capability that not only reflects individuals' proficiency in using digital technologies but also captures their ability to become increasingly self-efficacious through the training program and their technology readiness.

Furthermore, the effect sizes found in this study, particularly the relatively small coefficient for the direct effect of DQ on self-efficacy, suggest that although the relationship is statistically significant, other factors may exert a greater influence on students' self-efficacy. A more thorough analysis of potential moderating or mediating variables—such as prior digital literacy experience before college or socio-economic background—could provide a deeper understanding of these dynamics.

By addressing these alternative explanations and limitations, future research can build upon the present findings to develop a more comprehensive understanding of how Digital Intelligence contributes to self-efficacy and broader workforce readiness.

Implications

Theoretical Implications

This study offers several important theoretical contributions. Notably, it expands the body of research on DQ by moving beyond the development and validation of DQ scales, as explored in previous studies such as Na-Nan et al. (2020) and Wiroonrath et al. (2024). Instead, our research emphasizes the need to examine how DQ influences self-efficacy among university students in the Vietnamese context. By revealing the mediating role of technology readiness and the moderating effect of training program suitability in the relationship between DQ and students' self-efficacy, our findings offer valuable insights for universities striving to integrate digital pedagogy more effectively into their curricula. Additionally, by placing this study within Vietnam—a rapidly digitizing developing country—our research offers a new perspective. The theoretical model reflects Vietnam's unique socio-technological traits, enhancing the study's contributions to the field.

Future research could examine whether these relationships hold in countries with varying levels of digital maturity, thereby refining the generalizability of these findings. One potential limitation of these theoretical contributions is the lack of a broader comparative framework to evaluate how DQ affects self-efficacy across different educational systems and technological infrastructures. Additionally, the cross-sectional design of the study precludes deeper exploration of how DQ evolves over time and whether training interventions have long-term effects on self-efficacy.

Practical Implications

This study also has several practical implications. Driven by the rapid development of digital technologies, digital transformation has become a strategic necessity for companies to stay competitive. Our results identify DQ as a key predictor of self-efficacy among university students, mediated by technology readiness and moderated by the appropriateness of training programs. This implies that firms' top management should encourage employees to increase their DQ by designing interventions and programs such as workshops, seminars, extracurricular activities, and campaigns.

However, although DQ is recognized as a key driver of self-efficacy, it is important to consider the varying levels of access to and exposure to digital tools among students. Institutions with more advanced technological infrastructure may naturally promote higher self-efficacy, whereas students from under-resourced backgrounds might struggle despite having high DQ potential. Future research should investigate strategies to reduce this disparity and ensure equitable access to digital training programs.

Second, our findings emphasize the importance of collaboration between businesses and educational institutions in developing and implementing customized courses and programs on digital technologies. Such initiatives are essential for fostering digital resilience and enhancing students' technological competencies. While our results indicate that well-designed training programs increase self-efficacy, they do not comprehensively assess the effectiveness of various pedagogical approaches. Future research comparing experiential learning, industry partnerships, and self-directed digital learning modules could provide deeper insights into optimizing digital competency development.

Furthermore, the relatively small effect sizes observed in this study suggest that while the training program's suitability enhances the relationship between Digital Intelligence and self-efficacy, other contextual factors may also be important. To maximize the impact of digital literacy education, universities should not only integrate these courses into their curricula but also ensure that they align with industry needs and practical applications.

Finally, universities must prioritize developing strategic curricula that equip students with the digital skills needed to navigate and manage digital platforms effectively, ensuring they are prepared to meet the evolving demands of the modern workforce.

However, institutional constraints such as budget limitations, faculty expertise, and curriculum flexibility may impact the effectiveness of digital training initiatives. Policymakers and educational administrators must address these challenges by advocating for more substantial funding and support structures to foster the development of digital competencies on a larger scale.

Conclusion

This study examines the effect of DQ on students' self-efficacy and how the suitability of training programs plays an important role in shaping this effect in the context of Vietnam. The findings show that DQ positively affects students' self-efficacy, and this effect is stronger when students participate in appropriate training programs. These insights emphasize the importance of incorporating more digitally focused subjects into university curricula to enhance learners' digital skills and prepare them for the changing demands of the workforce in the digital age.

While these findings are significant, it is essential to consider alternative explanations for the observed relationships. Students with high self-efficacy may naturally seek opportunities to foster their Digital Intelligence, rather than having DQ be the sole factor driving self-efficacy. Furthermore, factors such as socioeconomic background, access to digital resources, and prior technological experience probably influence students' ability to utilize Digital Intelligence effectively. Future research could also examine other moderating or mediating variables, such as previous digital literacy skills or socioeconomic status.

Even though our findings are statistically significant and align with prior research, the magnitude of some effects is relatively small (e.g., $\beta = 0.07$ for DQ $\rightarrow$ SE), suggesting that, while the relationships exist, their practical impact may be limited. Furthermore, this study's reliance on self-reported measures introduces potential bias, as students may overestimate or underestimate their digital competencies. Future research should include performance-based assessments and qualitative approaches, such as interviews or case studies, to gain a more complete understanding

of the relationship between Digital Intelligence and self-efficacy. Additionally, while UEH is a prominent university in Vietnam, its student population may not fully represent the broader Vietnamese student body, particularly students from rural or economically disadvantaged backgrounds, who may have varying levels of access to digital resources. Expanding the scope of the study to include a more diverse set of institutions and students from different socio-economic backgrounds would strengthen the generalizability of the results.

To improve generalizability, future studies should extend beyond UEH to encompass a broader range of institutions across Vietnam, such as technical colleges and rural universities. Expanding the sample will allow for a more nuanced understanding of how Digital Intelligence influences self-efficacy across diverse educational and socioeconomic settings

Acknowledgment

We are sincerely appreciative of the DQ Institute's enthusiastic cooperation and support throughout this research. The DQ Institute's assistance in developing a specialized online survey platform supports the measurement of Vietnamese students' DQ and the collection of objective, accurate research data.

This platform has provided students with the opportunity to self-assess their digital competencies against national, regional, and global standards, while also enabling the research team to access high-quality datasets for analyzing and evaluating factors that affect students' self-perceived competence.

The professionalism and cooperative spirit of the DQ Institute are among the important factors that help this research achieve valuable results, making practical contributions to the development of digital training programs and enhancing

Fundings

This work was supported by the University of Economics Ho Chi Minh City (UEH) for the annual key topic [CS-2023-05].

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Appendix A – Survey Instrumentation

	Survey questions	Scale
Technology Readiness (Damerji & Salimi, 2021)		
Q1 ATP	New technologies contribute to a better quality of life.	Likert 1-5
Q2 ATP	Technology gives people more control over their daily lives.	Likert 1-5
Q3 ATP	Technology makes me more productive in my personal life.	Likert 1-5
Q4 ATP	I can usually figure out new high-tech products/services without help from others.	Likert 1-5
Q5 ATP	I keep up with the latest technological developments in my area of interest.	Likert 1-5
Self-efficacy (Adeyemo, 2007)		
Q6 CSE	I follow the themes and debates in lectures.	Likert 1-5
Q7 CSE	I read the recommended background material.	Likert 1-5
Q8 CSE	I write in an appropriate academic style.	Likert 1-5
Q9 CSE	I plan appropriate revision schedules.	Likert 1-5
Q10 CSE	I remain adequately motivated throughout.	Likert 1-5
Q11 CSE	I understand the material outlined and discussed with me by lecturers.	Likert 1-5
Training Program Suitability (Gangwar et al., 2015)		
Q12 STP	My level of understanding was substantially improved after going through the training program on digital technology.	Likert 1-5
Q13 STP	My university provided me complete training on digital technology.	Likert 1-5
Q14 STP	The training gave me confidence in use of digital technology.	Likert 1-5

Appendix B – Common Method Factor Analysis

Items	Substantive Factor Loading (R1)	R12	Method Factor Loading (R2)	R22
Technology Readiness				
ATP1	0.81***	0.66	-0.04	0.00
ATP2	0.80***	0.64	0.09	0.01
ATP3	0.83***	0.69	-0.10	0.01
ATP4	0.69***	0.48	-0.43***	0.18
ATP5	0.67***	0.45	-0.03	0.00
Self-efficacy				
CSE1	0.71***	0.50	-0.02	0.00
CSE2	0.70***	0.49	-0.41***	0.17
CSE3	0.70***	0.49	0.00	0.00
CSE4	0.74***	0.55	-0.13	0.02
CSE5	0.73***	0.53	0.01	0.00
CSE6	0.72***	0.52	0.03	0.00
Training Program Suitability				
STP1	0.75***	0.56	0.01	0.00
STP2	0.85***	0.72	0.33***	0.11
STP3	0.86***	0.74	-0.10*	0.01

Appendix C: Structural Results

	Variables	Model 2 (With the regulatory role of STP)				Model 1 (Without the regulatory role of STP)			
		TR		SE		TR		SE	
		β	t -statistic	β	t -statistic	β	t -statistic	β	t -statistic
H1	TR			0.34	10.16***			0.53	16.16***
H2	DQ	0.31	9.01***	0.08	6.27***	0.31	9.03***	0.07	2.26**
H3a	TPS			0.34	9.93***				
H3b	TPS*DQ			(0.09)	2.98***				
Adjusted R^2		0.29		0.41		0.27		0.31	

Note: ** represents the 5% significance level (2-tailed t-test); *** represents the 1% significance level (2-tailed t-test); DQ: DQ index; SE: Self-efficacy; TR: Technological Readiness; TPS: Training Program Suitability