

Integrating Digital Entrepreneurship and Economic Education to Enhance Entrepreneurial Competence and Business Innovation among University Students

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ABSTRACT

The digital economy requires universities to develop students' entrepreneurial competence and business innovation through economic and digital entrepreneurship education. This study examines the effects of economic education and digital entrepreneurship on entrepreneurial competence and business innovation among university students. Using a quantitative explanatory design, data were collected from 340 students in economics-, business-, management-, and economics education-related programs and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that economic education and digital entrepreneurship significantly affect entrepreneurial competence ($b = 0.515, p < 0.001$; $b = 0.450, p < 0.001$). Entrepreneurial competence and digital entrepreneurship significantly affect business innovation ($b = 0.557, p < 0.001$; $b = 0.390, p < 0.001$), while economic education has no significant direct effect ($b = -0.015, p = 0.695$). Entrepreneurial competence also mediates both relationships. The findings suggest that universities should integrate economic education, digital entrepreneurship, and competence-based learning to strengthen student business innovation.

Keywords: Business Innovation; Digital Entrepreneurship; Economic Education; Entrepreneurial Competence; University Students

JEL Classification: A20; I23; L26; O33; M13.

INTRODUCTION

The rapid advancement of digital technology has substantially transformed economic activities, business operations, and entrepreneurial practices. Digital transformation has not only changed how organizations operate but has also encouraged new business models, wider market access, and faster innovation across economic sectors. In this context, digital entrepreneurship has become an important phenomenon because it combines entrepreneurial activity with digital technologies, online platforms, data, and internet-based systems to identify and exploit opportunities in the digital economy (Abdulmalik et al., 2025; Karimi & Walter, 2021). The relevance of digital entrepreneurship has become stronger in the era of the Fourth Industrial Revolution, where artificial intelligence, cloud computing, big data, and digital platforms continue to reshape business structures and entrepreneurial behavior. Recent studies emphasize that digital entrepreneurship in higher education is no longer limited to online selling activities but has developed into an ecosystem-based entrepreneurial process involving digital competence, institutional support, innovation capability, and platform-based interaction among students, educators, and external stakeholders (Stockless et al., 2022; Tremblay & Poëllhuber, 2022).

The transformation of the digital economy has also changed the competencies required by future entrepreneurs. Contemporary entrepreneurship increasingly depends on the ability to use digital tools, interpret market information, build platform-based networks, and convert knowledge into innovative business value. Digital technologies allow entrepreneurs to design scalable business models, improve operational efficiency, collaborate with wider networks, and respond quickly to market changes (Karimi & Walter, 2021). Accordingly, universities are increasingly expected to function as entrepreneurial ecosystems that integrate entrepreneurship education, digital competence development, incubation activities, and experiential learning to prepare students for digital business environments (Kwon & Lee, 2024; Mijo & Qosja, 2023). This condition indicates that higher education institutions should not only transfer theoretical knowledge but also develop students' entrepreneurial competence and innovation capability so they can apply economic understanding in practical and technology-oriented business contexts.

However, many university students still face difficulties in transforming economic knowledge and exposure to digital entrepreneurship into concrete business innovation. Students may understand economic concepts and entrepreneurship theories, but they often struggle to convert this knowledge into market-oriented digital business initiatives. Entrepreneurship learning in higher education also frequently remains conceptual and fragmented, even though students are expected to operate in dynamic digital business ecosystems. Previous studies have shown that entrepreneurship education contributes to entrepreneurial intention, but intention does not always develop into entrepreneurial action or business innovation (Christina & Widjojo, 2023; Lv et al., 2021). Other studies also reveal that students often lack practical entrepreneurial competence, digital adaptability, and innovation-oriented skills despite receiving entrepreneurship-related education (Cui, 2021; Mei et al., 2020). Therefore, the central problem is not only whether students receive economic and entrepreneurial education, but also whether such education can be transformed into competencies that support innovation in the digital economy.

Economic education has a strategic role in this transformation because it equips students with economic literacy, financial understanding, opportunity recognition, and business decision-making capability. Previous research indicates that economic education

integrated with financial literacy and entrepreneurship learning can strengthen entrepreneurial mindset, business readiness, and opportunity evaluation skills (Kasimu & Jamilu, 2024; Kristian et al., 2024). In addition, learning approaches such as project-based learning, business simulations, inquiry-based learning, and experiential entrepreneurial activities have been found to improve entrepreneurial competence and practical business capability among students (Divac et al., 2022; Tunstall & Neergaard, 2022). Broader entrepreneurship education literature also emphasizes that entrepreneurship education should not only encourage business creation but also develop creativity, collaboration, problem-solving, and entrepreneurial thinking through competence-based learning models (Raveleau et al., 2018; Verzat et al., 2017). Nevertheless, many previous studies still focus mainly on entrepreneurial intention rather than examining how educational experiences contribute to business innovation outcomes in digital economic contexts.

The literature on entrepreneurial competence further explains that successful entrepreneurial outcomes depend on more than knowledge acquisition. Entrepreneurial competence reflects a multidimensional combination of knowledge, skills, attitudes, opportunity recognition, self-efficacy, creativity, adaptability, and risk-management capability needed to initiate and sustain entrepreneurial activities (Lv et al., 2021; Wang et al., 2022). Several studies have shown that entrepreneurship education influences entrepreneurial intention through entrepreneurial competence, psychological capital, and entrepreneurial self-efficacy (Christina & Widjojo, 2023; Cui, 2021; Lv et al., 2021; Mei et al., 2020). However, most of these studies position entrepreneurial competence mainly in relation to entrepreneurial intention, startup motivation, or entrepreneurial behavior. Limited attention has been given to how entrepreneurial competence mediates the relationship between economic education, digital entrepreneurship, and business innovation among university students. This limitation creates a theoretical and empirical gap, particularly because business innovation in the digital economy requires the integration of economic reasoning, digital capability, creativity, and entrepreneurial action.

Previous studies on digital entrepreneurship also tend to focus on digital technology adoption, platform ecosystems, and digital entrepreneurial environments without sufficiently integrating economic education into the same analytical framework (Bican & Brem, 2020; Satakina & Steiner, 2020). Some studies emphasize digital literacy and technological readiness, while others separately examine entrepreneurship education and entrepreneurial intention. Research on business innovation often discusses digital transformation and innovation ecosystems, but provides a limited explanation of the educational and competence-based mechanisms that enable students to generate innovation. As a result, the existing literature remains fragmented in explaining how economic education, digital entrepreneurship, entrepreneurial competence, and business innovation are interconnected within higher education. This study addresses this gap by proposing an integrative framework that positions entrepreneurial competence as the mechanism through which economic education and digital entrepreneurship can be converted into business innovation.

The novelty of this study lies in its integrated examination of economic education and digital entrepreneurship as antecedents of entrepreneurial competence and business innovation. Unlike previous studies that primarily focus on entrepreneurial intention, this study emphasizes entrepreneurial competence as a mediating variable that explains how students transform educational knowledge and digital entrepreneurial exposure into innovation-oriented outcomes. This approach responds to recent studies highlighting the importance of innovation-oriented entrepreneurial ecosystems, digital capability

development, and competency-based entrepreneurship education in higher education (Guo et al., 2025; Liaw et al., 2025). It also contributes to entrepreneurship education literature by clarifying the role of entrepreneurial competence as a bridge between economic knowledge, digital entrepreneurship, and practical business innovation capability.

This study is significant because universities are increasingly required to produce graduates who can compete in rapidly changing digital markets. Higher education institutions are encouraged to redesign entrepreneurship curricula by integrating economic education, digital entrepreneurship practices, experiential learning, startup incubation, and exposure to digital business ecosystems (Huang-Saad et al., 2018; Munari & Toschi, 2018). Therefore, this study aims to examine the effects of economic education and digital entrepreneurship on entrepreneurial competence and business innovation among university students. More specifically, it evaluates the mediating role of entrepreneurial competence in the relationships between economic education, digital entrepreneurship, and business innovation. The findings are expected to contribute theoretically to the development of entrepreneurship education and digital entrepreneurship literature, while also offering practical recommendations for universities in designing competence-based and innovation-oriented entrepreneurship curricula.

LITERATURE REVIEW

Digital Entrepreneurship, Economic Education, and Business Innovation in the Digital Economy

The rapid development of the digital economy has shifted entrepreneurial activities from conventional business practices to technology-driven ecosystems supported by digital platforms, data integration, and network-based innovation. In this context, digital entrepreneurship has emerged as a strategic approach that integrates entrepreneurial processes with digital technologies to identify and exploit opportunities in digitally connected markets (Abdulmalik et al., 2025; Karimi & Walter, 2021). It is not limited to conducting business through online channels, but reflects a broader transformation in how value is created, distributed, and sustained through digital ecosystems. Digital entrepreneurship develops through interactions among users, platform providers, technology developers, educational institutions, and business communities that collectively shape innovation processes in the digital economy (Karimi & Walter, 2021). Therefore, students and young entrepreneurs need not only entrepreneurial knowledge but also digital capability to adapt to technological change and generate innovative business solutions.

From the perspective of human capital theory, education represents an important investment that improves individual knowledge, competence, and productivity. Economic education becomes a key mechanism for developing entrepreneurial human capital because it equips students with economic literacy, financial management skills, opportunity recognition capability, and business decision-making competence (Kasimu & Jamilu, 2024; Kristian et al., 2024). In higher education, economic education is increasingly expected to move beyond theoretical instruction by integrating entrepreneurship-oriented learning experiences that prepare students for participation in the digital economy. Previous studies show that entrepreneurship and economic education can strengthen entrepreneurial competence through experiential learning approaches, including project-based learning, inquiry-based learning, and business simulations (Divac et al., 2022; Tunstall & Neergaard, 2022). Thus, educational

processes play a strategic role in developing competencies that support innovative entrepreneurial behavior.

Entrepreneurial competence theory further explains that competence consists of knowledge, skills, attitudes, creativity, adaptability, and opportunity-recognition capability that enable individuals to engage effectively in entrepreneurial activities (Lv et al., 2021). In the digital economy, entrepreneurial competence becomes increasingly important because students are required to integrate digital technology, business strategy, innovation capability, and market responsiveness simultaneously. Empirical studies indicate that entrepreneurial competence contributes to entrepreneurial outcomes, including entrepreneurial intention, business growth, innovation capability, and venture sustainability (Christina & Widjojo, 2023; Wang et al., 2022). Therefore, entrepreneurial competence can be understood as a strategic mechanism through which economic education and digital entrepreneurship are transformed into business innovation outcomes.

The relationship between digital entrepreneurship and business innovation can also be explained through the resource-based view (RBV), which states that competitiveness and innovation depend on the effective use of valuable resources and capabilities. In digital entrepreneurship, digital technology, data utilization, platform access, and digital literacy function as strategic resources that enable entrepreneurs to create innovative products, services, and business models (Bican & Brem, 2020; Satalkina & Steiner, 2020). Digital entrepreneurship encourages innovation through technology-enabled collaboration, data-driven decision-making, and digital market expansion. Consequently, students with stronger digital entrepreneurial exposure are more likely to develop adaptive entrepreneurial competence and business innovation capability aligned with digital economic transformation.

Although previous studies have examined entrepreneurship education, entrepreneurial competence, digital literacy, and business innovation, the relationships among these variables remain fragmented. Many studies emphasize entrepreneurial intention as the main outcome of entrepreneurship education, while fewer studies explain how economic education and digital entrepreneurship simultaneously influence business innovation through entrepreneurial competence (Christina & Widjojo, 2023; Lv et al., 2021). Existing studies also tend to position entrepreneurial competence as a direct outcome rather than as a mediating mechanism that transforms educational and digital entrepreneurial exposure into innovation capability. This limitation indicates the need for an integrated framework that explains how economic education and digital entrepreneurship contribute to business innovation by strengthening entrepreneurial competence.

Based on these theoretical and empirical foundations, this study proposes an integrated conceptual framework linking economic education, digital entrepreneurship, entrepreneurial competence, and business innovation. Economic education is expected to strengthen entrepreneurial competence by developing economic literacy, analytical capability, and business decision-making skills. At the same time, digital entrepreneurship is expected to enhance entrepreneurial competence by encouraging students to use digital technologies, platforms, and innovation-oriented entrepreneurial practices. Entrepreneurial competence subsequently functions as a mediating mechanism that enables students to transform economic knowledge and digital entrepreneurial capability into innovative business outcomes. Therefore, this study positions entrepreneurial competence as the bridge connecting economic education and digital entrepreneurship with business innovation.

Hypotheses Development

Economic Education and Entrepreneurial Competence

Human capital theory explains that education improves individual knowledge, skills, competence, and productivity. In the entrepreneurship context, economic education strengthens students' financial literacy, market understanding, opportunity recognition, and rational business decision-making capability. These forms of knowledge are essential because entrepreneurial competence does not only depend on motivation, but also on students' ability to analyze economic conditions, assess business risks, and evaluate market opportunities.

Previous studies show that economic education contributes positively to entrepreneurial competence because students with stronger economic literacy and financial understanding tend to demonstrate better entrepreneurial readiness and business capability (Kasimu & Jamilu, 2024; Kristian et al., 2024). Entrepreneurship-oriented learning approaches, including project-based learning and experiential learning, also strengthen entrepreneurial competence, creativity, and problem-solving capability (Divac et al., 2022; Lv et al., 2021). Therefore, students who receive stronger economic education are expected to develop higher entrepreneurial competence.

H1: Economic education positively affects entrepreneurial competence.

Digital Entrepreneurship and Entrepreneurial Competence

Digital entrepreneurship theory emphasizes that entrepreneurial activity in the digital economy requires digital capability, technological adaptability, and innovation-oriented entrepreneurial competence. Exposure to digital entrepreneurship enables students to develop competence in opportunity recognition, digital innovation, collaboration, and the use of technology in business processes. These capabilities are increasingly important because entrepreneurial activity is now closely connected to digital platforms, online markets, and technology-based business models.

Research indicates that digital entrepreneurial activities encourage creativity, flexibility, and innovation capability because digital technology allows entrepreneurs to access broader markets and develop platform-based business models (Abdulmalik et al., 2025; Karimi & Walter, 2021). Digital entrepreneurship also supports experimentation and collaborative learning, which are important for strengthening entrepreneurial competence in dynamic business environments. Therefore, students with stronger exposure to digital entrepreneurship are expected to have higher entrepreneurial competence.

H2: Digital entrepreneurship positively affects entrepreneurial competence.

Entrepreneurial Competence and Business Innovation

Entrepreneurial competence theory explains that individuals with strong entrepreneurial competence are more capable of identifying opportunities, generating innovative ideas, adapting to environmental change, and implementing business strategies. Entrepreneurial competence enables individuals to mobilize resources effectively and convert business opportunities into practical entrepreneurial actions. In this sense, competence becomes an important foundation for innovation because innovative outcomes require not only ideas but also the capability to execute them.

Previous studies demonstrate that entrepreneurial competence contributes significantly to business innovation because competent entrepreneurs are more likely to engage in product innovation, service innovation, and innovative business model development (Li

et al., 2022; Wang et al., 2022). In the digital economy, this relationship becomes more important because innovation requires the integration of entrepreneurial competence, digital technology, creativity, and market responsiveness. Therefore, entrepreneurial competence is expected to improve business innovation.

H3: Entrepreneurial competence positively affects business innovation.

Economic Education and Business Innovation

Economic education may also contribute to business innovation by helping students understand market dynamics, business opportunities, resource allocation, and strategic decision-making. Through economic literacy and entrepreneurship-oriented learning, students can develop analytical thinking and innovation capability needed to generate new business ideas and respond to changing market conditions. Economic education, therefore, provides an important knowledge foundation for innovation-oriented entrepreneurial behavior.

The literature indicates that economic education integrated with entrepreneurship and financial literacy supports entrepreneurial readiness and innovation-oriented behavior because students become more capable of evaluating opportunities and implementing creative business strategies (Kasimu & Jamilu, 2024; Kristian et al., 2024). Experiential learning in entrepreneurship education also provides practical experiences that help students develop innovative products, services, and business models (Divac et al., 2022). Therefore, economic education is expected to support business innovation.

H4: Economic education positively affects business innovation.

Digital Entrepreneurship and Business Innovation

The RBV explains that digital capability and technological resources can function as strategic assets that improve innovation performance and business competitiveness. In digital entrepreneurship, technology, data analytics, online platforms, and digital networks allow entrepreneurs to create new products, improve operational efficiency, reach wider markets, and develop innovative business models (Bican & Brem, 2020; Satakina & Steiner, 2020).

Digital entrepreneurship also encourages experimentation, collaboration, and rapid market adaptation because digital platforms provide flexible spaces for testing ideas and responding to customer needs. As a result, students who are more capable of using digital entrepreneurial tools are more likely to develop innovative business solutions. Therefore, digital entrepreneurship is expected to directly improve business innovation.

H5: Digital entrepreneurship positively affects business innovation.

The Mediating Role of Entrepreneurial Competence in the Relationship Between Economic Education and Business Innovation

Economic education strengthens entrepreneurial competence by developing students' economic reasoning, opportunity recognition capability, financial understanding, and entrepreneurial capability. However, economic knowledge does not automatically produce innovation unless students are able to apply it through entrepreneurial action. Entrepreneurial competence, therefore, becomes the mechanism that enables students to transform economic understanding into innovative business ideas and activities.

Previous studies indicate that entrepreneurial competence mediates the relationship between entrepreneurship education and entrepreneurial outcomes because

competence serves as the pathway through which educational experiences are converted into entrepreneurial capability and innovation-oriented behavior (Christina & Widjojo, 2023; Li et al., 2023; Lv et al., 2021). Therefore, entrepreneurial competence is expected to mediate the relationship between economic education and business innovation.

H6: Entrepreneurial competence mediates the relationship between economic education and business innovation.

The Mediating Role of Entrepreneurial Competence in the Relationship Between Digital Entrepreneurship and Business Innovation

Digital entrepreneurship enhances students' exposure to digital technologies, platform ecosystems, and innovation-oriented entrepreneurial practices. This exposure can strengthen entrepreneurial competence by developing students' adaptability, creativity, digital problem-solving capability, and ability to identify technology-based business opportunities. Students with stronger entrepreneurial competence are then more capable of translating digital entrepreneurial knowledge and technological capability into innovative business outcomes.

Previous studies emphasize that entrepreneurial competence functions as an important explanatory mechanism linking entrepreneurial learning experiences and entrepreneurial outcomes (Christina & Widjojo, 2023; Lv et al., 2021). Therefore, entrepreneurial competence is expected to mediate the relationship between digital entrepreneurship and business innovation.

H7: Entrepreneurial competence mediates the relationship between digital entrepreneurship and business innovation.

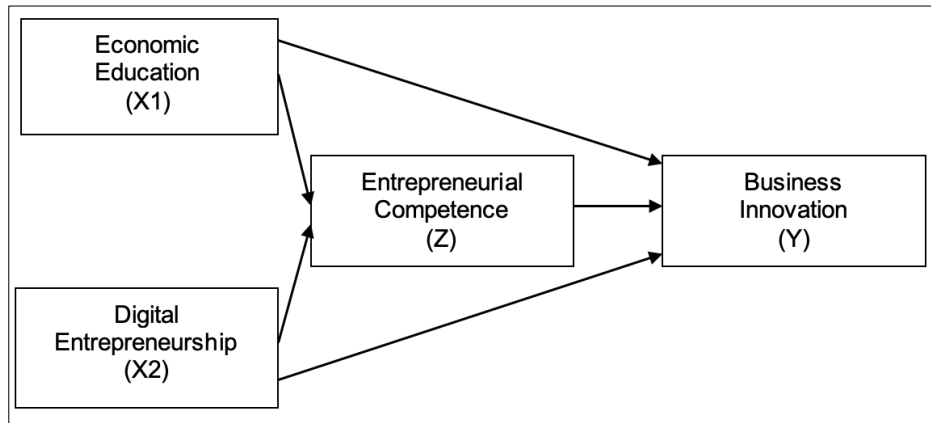
Conceptual Framework

This study proposes an integrated conceptual framework explaining the relationships among economic education, digital entrepreneurship, entrepreneurial competence, and business innovation in the digital economy. Grounded in human capital theory, entrepreneurial competence theory, digital entrepreneurship theory, and the RBV, the framework positions economic education and digital entrepreneurship as antecedent variables, entrepreneurial competence as a mediating variable, and business innovation as the outcome variable.

Economic education is expected to strengthen entrepreneurial competence by developing students' economic literacy, financial capability, analytical thinking, and business decision-making skills. Digital entrepreneurship is expected to strengthen entrepreneurial competence through students' exposure to digital technologies, online platforms, digital ecosystems, and innovation-oriented entrepreneurial practices. In addition, both economic education and digital entrepreneurship are expected to influence business innovation directly, although their effects may operate through different mechanisms.

Entrepreneurial competence occupies a central position in the framework because it reflects students' ability to recognize opportunities, manage resources, adapt to change, and develop innovative products, services, and business models. Therefore, the framework proposes that economic education and digital entrepreneurship influence business innovation both directly and indirectly through entrepreneurial competence. This framework is presented in Figure 1.

Figure 1. Research Framework



RESEARCH METHOD

Research Design

This study employed a quantitative explanatory research design to examine the relationships among economic education, digital entrepreneurship, entrepreneurial competence, and business innovation among university students in the context of the digital economy. The quantitative approach was considered appropriate because the study aimed to measure the strength and significance of relationships among latent variables using statistical analysis. Meanwhile, the explanatory design was used because the research model was developed from previous theoretical and empirical studies and tested through direct and indirect relationships among constructs (Christina & Widjojo, 2023; Lv et al., 2021). This design enabled the study to explain not only the direct effects of economic education and digital entrepreneurship on entrepreneurial competence and business innovation, but also the mediating role of entrepreneurial competence in the proposed model.

The study was conducted in higher education institutions offering economics, business, management, and economics education study programs. These academic settings were selected because students in these programs generally receive exposure to economic concepts, entrepreneurship courses, digital business practices, and innovation-oriented learning activities. Therefore, the research context was relevant for examining how educational experience and digital entrepreneurial exposure contribute to entrepreneurial competence and business innovation.

Population and Sampling

The population of this study consisted of undergraduate students enrolled in economics, management, business, and economics education study programs who had taken entrepreneurship-related courses. These students were selected because they were considered to have sufficient academic exposure to economic literacy, business decision-making, entrepreneurial concepts, and digital business activities. The use of student respondents was also consistent with the objective of the study, which focused on entrepreneurial competence and business innovation among university students.

A purposive sampling technique was applied to ensure that the respondents met the characteristics required by the research model. The respondent criteria included students who had taken business or entrepreneurship courses, students who were familiar with digital technology and online business platforms, and students who had experience with or interest in entrepreneurial activities. These criteria were used to

ensure that the respondents were able to evaluate the questionnaire items based on relevant educational and entrepreneurial experiences.

This study involved 340 respondents. The sample size was considered adequate for Partial Least Squares Structural Equation Modeling (PLS-SEM) because the model included several latent variables, multiple indicators, and mediation relationships. A sample of 340 respondents also provided sufficient statistical power to estimate both measurement and structural models, particularly because the study examined direct effects, indirect effects, and predictive relationships among constructs.

Measurement

The research instrument was developed using a structured questionnaire adapted from relevant previous studies. The questionnaire measured four main constructs, namely economic education, digital entrepreneurship, entrepreneurial competence, and business innovation. All items were measured using a five-point Likert scale, ranging from 1, representing “strongly disagree,” to 5, representing “strongly agree.” The Likert scale was selected because it enables respondents to express the degree of their agreement with each statement and is commonly used in studies examining perceptions, attitudes, competence, and behavioral tendencies.

Economic education was measured using indicators related to economic literacy, financial understanding, market analysis, opportunity evaluation, and business decision-making capability. These indicators were adapted from studies on financial literacy, economic education, and entrepreneurship learning (Kasimu & Jamilu, 2024; Kristian et al., 2024). Digital entrepreneurship was measured through indicators reflecting students’ ability to use digital technology, online platforms, digital resources, and technology-based entrepreneurial activities. These indicators were developed based on the digital entrepreneurship perspective proposed in previous studies (Abdulmalik et al., 2025; Karimi & Walter, 2021).

Entrepreneurial competence was measured using indicators related to opportunity recognition, business planning, creativity, innovation capability, adaptability, risk management, and entrepreneurial problem-solving. These indicators were adapted from entrepreneurial competence literature, which explains competence as a combination of knowledge, skills, attitudes, and entrepreneurial capability (Lv et al., 2021; Wang et al., 2022). Business innovation was measured using indicators related to students’ ability to develop new products, services, business models, digital marketing strategies, and creative business solutions. These indicators were adapted from innovation-oriented entrepreneurship and digital business model literature (Bican & Brem, 2020; Satalkina & Steiner, 2020).

Before data collection, the questionnaire items were reviewed and adjusted to ensure clarity, relevance, and suitability for the higher education context. The wording of the items was refined to make the instrument understandable for student respondents while maintaining consistency with the theoretical meaning of each construct.

Data Collection

Data were collected through an online survey distributed to respondents who met the sampling criteria. The online survey method was used because it allowed efficient data collection from students across relevant study programs and supported broader respondent participation. Prior to completing the questionnaire, respondents were informed about the purpose of the study, the voluntary nature of their participation, and the confidentiality of their responses.

Ethical considerations were maintained throughout the data collection process. Respondents' identities were not disclosed, and the data were used only for academic research purposes. Participation was based on informed consent, and respondents were given the opportunity to complete the questionnaire voluntarily. These procedures were applied to protect respondent privacy and to ensure that the data were collected responsibly.

Data Screening

Before the main analysis, data screening was conducted to ensure that the dataset was suitable for statistical testing. The screening process included checking missing values, incomplete responses, inconsistent answers, and potential outliers. Responses with substantial missing data or incomplete answers were excluded from the analysis. The response patterns were also reviewed to identify unusual or careless responses that could affect the quality of the results.

Although PLS-SEM does not require strict normality assumptions, the data distribution was examined to understand the general characteristics of the dataset and to ensure that no severe data problems were present. Common method bias was also minimized through procedural remedies, including anonymous responses, clear questionnaire instructions, and item wording that reduced ambiguity. These procedures were applied because all variables were collected using the same questionnaire instrument.

Data Analysis

The data were analyzed using PLS-SEM with SmartPLS software. PLS-SEM was selected because it is suitable for analyzing latent variables, complex structural models, predictive relationships, and mediation effects. This method is also appropriate for research models involving multiple constructs and indicators because it enables simultaneous evaluation of the measurement model and structural model. In addition, PLS-SEM is useful for studies that aim to explain variance in endogenous variables and test theoretical models in entrepreneurial and educational research contexts.

The analysis was conducted in two stages. The first stage assessed the measurement model to evaluate construct validity and reliability. This assessment included outer loading, Average Variance Extracted (AVE), Composite Reliability, and Cronbach's Alpha. Outer loading values were used to evaluate indicator reliability, while AVE was used to assess convergent validity. Composite Reliability and Cronbach's Alpha were used to examine internal consistency reliability.

The second stage evaluated the structural model to test the proposed hypotheses. This stage examined path coefficients, t-statistics, p-values, coefficient of determination, effect size, predictive relevance, and model fit. Bootstrapping was used to test the significance of direct and indirect effects among economic education, digital entrepreneurship, entrepreneurial competence, and business innovation. The mediation analysis was conducted to determine whether entrepreneurial competence explains the indirect relationships between economic education and business innovation, as well as between digital entrepreneurship and business innovation. Through this analytical procedure, the study was able to evaluate the predictive and explanatory power of the proposed research model in the context of university students' business innovation.

RESULTS

Respondents' Demographic Profile

Table 1. Respondents' Demographic Profile

Characteristics	Frequency	Percentage (%)
Gender		
Male	162	47.6
Female	178	52.4
Age		
18–19 years	66	19.4
20–21 years	158	46.5
22–23 years	74	21.8
≥24 years	42	12.4
Study Program		
Business	75	22.1
Economic Education	99	29.1
Economics	87	25.6
Management	79	23.2

As presented in [Table 1](#), the majority of respondents were female students (52.4%), while male students accounted for 47.6%. Based on age distribution, most respondents were 20-21 years old (46.5%), suggesting that the participants were predominantly students in the middle phase of their academic studies. Regarding academic background, respondents were relatively evenly distributed across study programs, with the largest proportion from Economic Education (29.1%), followed by Economics (25.6%), Management (23.2%), and Business (22.1%). This distribution indicates that the respondents represented students with educational exposure relevant to entrepreneurship, economics, and digital business activities.

Measurement Model Evaluation

Table 2. Measurement Model Evaluation

Construct	Indicators	Loading Range	AVE	Composite Reliability	Cronbach Alpha
Economic Education (EE)	EE1–EE8	0.884–0.908	0.801	0.970	0.965
Digital Entrepreneurship (DE)	DE1–DE8	0.883–0.918	0.811	0.972	0.967
Entrepreneurial Competence (EC)	EC1–EC10	0.881–0.903	0.792	0.974	0.971
Business Innovation (BI)	BI1–BI8	0.900–0.920	0.827	0.974	0.970

[Table 2](#)'s findings show that every indicator attained outer loading values more than 0.70, indicating adequate indicator reliability and convergent validity. Each concept sufficiently explains the variation in its indicators, as evidenced by AVE values for all constructs exceeding 0.50. Furthermore, Cronbach's Alpha and Composite Reliability scores were all greater than 0.70, indicating strong internal consistency. These results validate the model's validity and reliability for assessing the structural connections among business innovation, entrepreneurial competence, digital entrepreneurship, and economic education.

Discriminant Validity

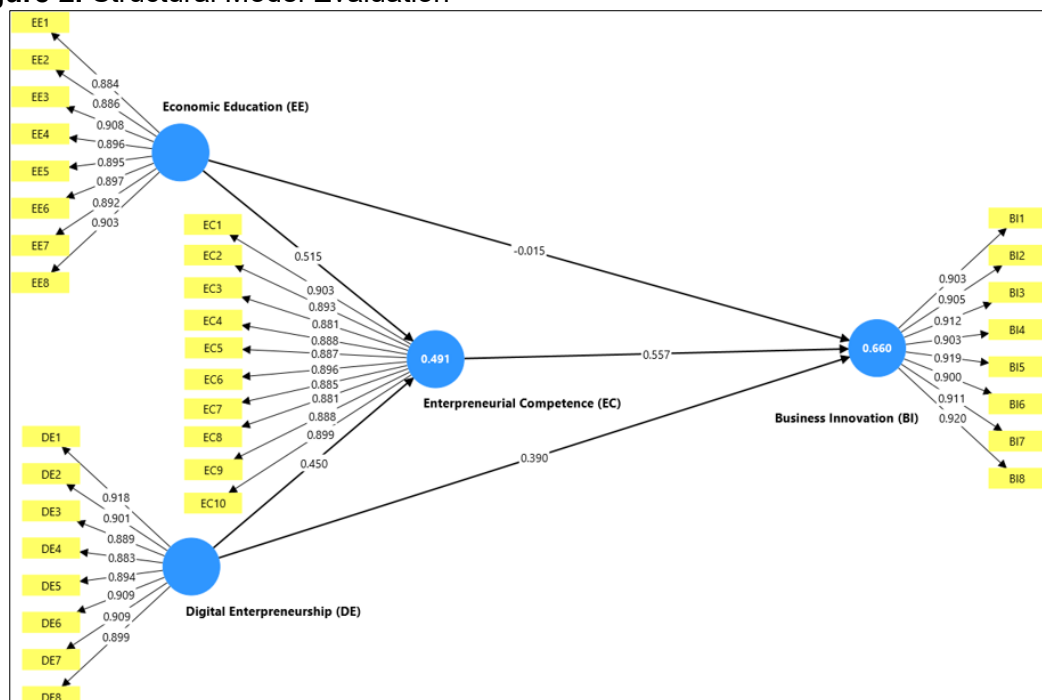
Table 3. Discriminant Validity (HTMT)

Constructs	BI	DE	EE	EC
Business Innovation	-			
Digital Entrepreneurship	0.675	-		
Economic Education	0.313	0.053	-	
Entrepreneurial Competence	0.756	0.490	0.555	-

Each construct has sufficient discriminant validity because the HTMT values in [Table 3](#) were all below the 0.90 cutoff. This outcome shows that the study's constructs are empirically unique and assess several conceptual aspects of the research model.

Structural Model Evaluation

Figure 2. Structural Model Evaluation



All indicators maintained loading values above 0.70, as indicated by the structural model results in [Figure 2](#), confirming the applicability of the reflective measurement approach. Additionally, path coefficient analysis was used to investigate the structural links between the constructs.

Path Analysis

Table 4. Path Analysis

Relationship	Path Coefficient	T-Statistic	P-Value
EE → EC	0.515	13.698	0.000
DE → EC	0.450	11.941	0.000
EC → BI	0.557	12.446	0.000
EE → BI	-0.015	0.392	0.695
DE → BI	0.390	9.571	0.000

The results in [Table 4](#) show that economic education has a positive and significant influence on entrepreneurial competence ($\beta = 0.515$; $p < 0.001$), supporting H1. This finding indicates that students with stronger economic literacy and greater exposure to

entrepreneurial learning tend to have higher entrepreneurial competence. Digital entrepreneurship also significantly influences entrepreneurial competence ($\beta = 0.450$; $p < 0.001$), supporting H2. This result demonstrates that students who are more capable of using digital technology and online platforms tend to develop stronger entrepreneurial competence.

Furthermore, entrepreneurial competence has a positive and significant effect on business innovation ($\beta = 0.557$; $p < 0.001$), supporting H3. This suggests that entrepreneurial capability plays an important role in encouraging students' innovative business activities. However, the direct relationship between economic education and business innovation is not significant ($\beta = -0.015$; $p = 0.695$), indicating that H4 is not supported. This finding suggests that economic education alone is insufficient to generate business innovation without being transformed into entrepreneurial competence. Finally, digital entrepreneurship has a positive and significant direct effect on business innovation ($\beta = 0.390$; $p < 0.001$), supporting H5. This confirms that exposure to digital entrepreneurship directly enhances students' innovation capability in the digital economy.

Mediation Analysis

Table 5. Indirect Effects

Relationship	Indirect Effect	T-Statistic	P-Value
EE → EC → BI	0.287	8.684	0.000
DE → EC → BI	0.251	8.734	0.000

The results in [Table 5](#) indicate that entrepreneurial competence significantly mediates the relationship between economic education and business innovation, supporting H6. This finding indicates that economic education indirectly contributes to business innovation by strengthening students' entrepreneurial competence. Similarly, entrepreneurial competence significantly mediates the relationship between digital entrepreneurship and business innovation, supporting H7. This result confirms that entrepreneurial competence is an important mechanism through which digital entrepreneurial capability translates into innovative business outcomes.

Explanatory Power of the Model

Table 6. Coefficient of Determination (R^2)

Endogenous Variable	R^2	Adjusted R^2
Business Innovation	0.660	0.657
Entrepreneurial Competence	0.491	0.488

The R^2 value of 0.660 in [Table 6](#) shows that entrepreneurial competence, digital entrepreneurship, and economic education account for 66% of the variance in business innovation. This outcome shows that the proposed model has strong explanatory power in explaining students' business innovation capability. Meanwhile, the R^2 value of 0.491 indicates that 49.1% of the variance in entrepreneurial competence is explained by economic education and digital entrepreneurship, suggesting that both variables substantially contribute to its development.

Effect Size (f^2)

Table 7. Effect Size

Predictor	BI	EC
Digital Entrepreneurship	0.320	0.396
Economic Education	0.000	0.520
Entrepreneurial Competence	0.465	-

The results in [Table 7](#) indicate that entrepreneurial competence has the strongest effect on business innovation ($f^2 = 0.465$), highlighting its central role in driving students' innovation capability. Economic education had a substantial effect on entrepreneurial competence ($f^2 = 0.520$), indicating that entrepreneurship-oriented economic education strongly contributes to the development of entrepreneurial competence. Digital entrepreneurship also showed meaningful effects on both entrepreneurial competence and business innovation, emphasizing the importance of digital capability in entrepreneurial activities.

Predictive Relevance

Table 8. Q² Predict

Variable	Q ²	RMSE	MAE
Business Innovation	0.496	0.714	0.575
Entrepreneurial Competence	0.485	0.722	0.584

The Q² values for business innovation (0.496) and entrepreneurial competence (0.485) were positive according to [Table 8](#), indicating that the research model has good predictive relevance. These findings demonstrate that the model can effectively predict endogenous constructs in the context of digital entrepreneurship and business innovation among students.

Model Fit

Table 9. Model Fit Indices

Index	Value
SRMR	0.026
NFI	0.950

The SRMR value of 0.026 in [Table 9](#) was below the recommended threshold of 0.08, indicating excellent model fit. In addition, the NFI value of 0.950 indicates a strong goodness-of-fit for the proposed structural model. These results confirm that the overall research model is well fitted to the observed data and suitable for explaining the relationships among economic education, digital entrepreneurship, entrepreneurial competence, and business innovation.

DISCUSSION

The Effect of Economic Education on Entrepreneurial Competence

The results indicate that economic education has a positive and significant effect on entrepreneurial competence, thereby supporting H1. This finding confirms that economic education strengthens students' entrepreneurial capability by improving economic literacy, financial understanding, opportunity recognition, and business decision-making skills. Students with stronger economic understanding are more capable of identifying market opportunities, evaluating business risks, and managing entrepreneurial resources effectively. This result is consistent with previous studies showing that economic education and financial literacy contribute significantly to entrepreneurial competence development ([Kasimu & Jamilu, 2024](#); [Kristian et al., 2024](#)). It is also supported by studies on university students showing that financial competence improves rational financial behavior, budgeting behavior, financial discipline, and decision-making capability in digital economic environments ([Teoh, Teow et al., 2026](#); [Teoh, Zulkurnein et al., 2026](#)).

Furthermore, entrepreneurship-oriented education strengthens students' entrepreneurial mindset and business capability through experiential learning processes (Christina & Widjojo, 2023; Lv et al., 2021). Therefore, economic education should not be viewed merely as theoretical instruction, but as a foundation for developing practical entrepreneurial competence in the digital economy. This finding also supports human capital theory, which emphasizes that education enhances individual competence and productivity by transforming knowledge into capabilities that can be applied in entrepreneurial activities.

The Effect of Digital Entrepreneurship on Entrepreneurial Competence

The results demonstrate that digital entrepreneurship positively and significantly affects entrepreneurial competence, thereby supporting H2. This finding indicates that students who are able to use digital technology, online platforms, and digital business systems tend to develop stronger entrepreneurial competence. In the digital economy, entrepreneurial activities increasingly require digital capability, adaptability, and innovation-oriented thinking because students must be able to identify technology-based opportunities, develop innovative business models, and respond to rapid market changes. Previous studies similarly emphasize that digital entrepreneurship supports creativity, problem-solving capability, and entrepreneurial adaptability in digital business environments (Abdulmalik et al., 2025; Karimi & Walter, 2021).

This finding is also consistent with Firdaussiah et al. (2026), who explained that digital transformation strengthens organizational adaptability and competitiveness by enabling organizations to optimize internal resources and improve strategic responsiveness in competitive digital markets. In the context of this study, digital entrepreneurship is therefore not merely an additional entrepreneurial skill, but an essential component of entrepreneurial competence. Students with greater exposure to digital entrepreneurship are better prepared to integrate technology into entrepreneurial activities and participate effectively in digital business ecosystems.

The Effect of Entrepreneurial Competence on Business Innovation

The results indicate that entrepreneurial competence has a positive and significant effect on business innovation, thereby supporting H3. This finding confirms that entrepreneurial competence is a central determinant of students' innovation capability because competent students are more able to recognize opportunities, generate creative ideas, adapt to changing business environments, and implement innovative business solutions. This is consistent with previous studies explaining that entrepreneurial competence contributes to innovation-oriented entrepreneurial behavior through adaptability, business planning capability, and opportunity-recognition skills (Li et al., 2022; Wang et al., 2022).

In the digital economy, entrepreneurial competence becomes increasingly important because innovation requires the integration of entrepreneurial competence, digital capability, and market responsiveness. This finding is also aligned with Teoh, Zulkurnein et al. (2026), who showed that behavioral and competence-based mechanisms are essential in transforming financial knowledge into practical outcomes. Similarly, Firdaussiah et al. (2026) emphasized that organizational capability functions as a pathway through which resources generate sustainable competitive advantage. These studies reinforce the argument that entrepreneurial competence enables students to translate educational knowledge and digital entrepreneurial exposure into innovative business outcomes.

The Effect of Economic Education on Business Innovation

The results show that economic education does not have a significant direct effect on business innovation; therefore, H4 is not supported. This finding suggests that theoretical economic knowledge alone is insufficient to generate innovative business outcomes among students. Although economic education provides understanding of market mechanisms, economic analysis, and business decision-making, innovation capability requires more practical, adaptive, and technology-oriented competencies. In the digital economy, business innovation is shaped not only by conceptual knowledge but also by entrepreneurial competence, creativity, practical experience, and the ability to use digital technology in business processes.

This finding is consistent with previous literature emphasizing that innovation emerges through the integration of digital technology, entrepreneurial capability, and adaptive business models rather than through theoretical knowledge alone (Bican & Brem, 2020; Sataikina & Steiner, 2020). It is also supported by Teoh, Zulkurnein et al. (2026), who found that financial literacy and budgeting knowledge do not always translate directly into practical financial outcomes without behavioral and competence-based mechanisms. Similarly, Firdaussiah et al. (2026) demonstrated that organizational resources do not automatically generate competitive advantage unless transformed through digital capability and adaptive processes. Thus, the non-significant relationship reinforces the need to integrate economic education with practice-based entrepreneurial learning, digital entrepreneurship activities, and innovation-oriented educational approaches in higher education.

The Effect of Digital Entrepreneurship on Business Innovation

The findings show that digital entrepreneurship has a positive and significant effect on business innovation, thereby supporting H5. This result indicates that students' ability to use digital technology directly strengthens their innovation capability in entrepreneurial activities. Digital entrepreneurship enables students to create digital products and services, develop platform-based business models, improve operational efficiency, and respond more quickly to market changes through technology utilization.

This finding is consistent with previous studies showing that digital entrepreneurship is a major driver of innovation because digital platforms support experimentation, collaboration, and rapid adaptation in dynamic business environments (Bican & Brem, 2020; Sataikina & Steiner, 2020). It is also strengthened by Firdaussiah et al. (2026), who demonstrated that digital transformation contributes to sustainable competitive advantage by improving responsiveness, strategic flexibility, and innovation capability. In addition, Sitiari et al. (2026) emphasized that adaptive entrepreneurial orientation and innovation capability are important determinants of long-term business sustainability. Therefore, digital entrepreneurial capability is increasingly important in higher education because students with stronger digital exposure are more likely to demonstrate business innovation capability.

The Mediating Role of Entrepreneurial Competence in the Relationship Between Economic Education and Business Innovation

The mediation analysis demonstrates that entrepreneurial competence significantly mediates the relationship between economic education and business innovation, thereby supporting H6. This finding confirms that economic education contributes to innovation outcomes mainly by strengthening students' entrepreneurial competence. Economic education improves economic reasoning, opportunity-recognition capability, and entrepreneurial skills, while entrepreneurial competence enables students to apply this knowledge in creating innovative business ideas and solutions. This also explains why

economic education does not directly influence business innovation, as theoretical knowledge requires entrepreneurial competence as an intermediary mechanism before it can be transformed into innovation.

This result is consistent with [Teoh, Zulkurnein et al. \(2026\)](#), who found that budgeting behavior mediates the relationship between financial knowledge and financial stability. Similarly, [Firdaussiah et al. \(2026\)](#) showed that digital transformation mediates the relationship between internal resources and competitive advantage. These studies support the argument that competence-based and behavioral mechanisms are necessary to convert knowledge and resources into meaningful outcomes. Therefore, higher education institutions should not only transfer economic knowledge but also strengthen entrepreneurial competence through practical entrepreneurial learning, experiential activities, and the integration of digital entrepreneurship.

The Mediating Role of Entrepreneurial Competence in the Relationship Between Digital Entrepreneurship and Business Innovation

The results further indicate that entrepreneurial competence significantly mediates the relationship between digital entrepreneurship and business innovation, thereby supporting H7. This finding shows that digital entrepreneurship contributes to innovation both directly through technology utilization and indirectly by strengthening entrepreneurial competence. Students with stronger digital entrepreneurial capability tend to develop adaptability, creativity, problem-solving ability, and innovation-oriented thinking, which enable them to transform digital entrepreneurial exposure into innovative business activities and business model development.

This finding is consistent with [Firdaussiah et al. \(2026\)](#), who demonstrated that digital transformation mediates the relationship between organizational resources and sustainable competitive advantage by converting internal resources into adaptive capabilities. It is also supported by [Sitiari et al. \(2026\)](#), who emphasized that entrepreneurial orientation and adaptive capability are essential for sustaining innovation and long-term business development in dynamic business environments. Therefore, entrepreneurial competence serves as the key explanatory mechanism through which digital entrepreneurial capability becomes business innovation. These findings highlight the importance of integrating digital entrepreneurial activities, competence-based learning, and innovation-oriented educational ecosystems in higher education.

Research Implications

Theoretical Implications

This study contributes to the literature on economic education, digital entrepreneurship, entrepreneurial competence, and business innovation by clarifying the mechanism through which educational and digital entrepreneurial factors influence innovation outcomes. The findings show that economic education strengthens business innovation mainly through entrepreneurial competence, rather than through a direct effect. This indicates that theoretical economic knowledge alone is insufficient to produce innovation-oriented outcomes unless it is transformed into practical entrepreneurial capability.

The findings also support digital entrepreneurship theory by confirming that digital entrepreneurship improves both entrepreneurial competence and business innovation. Digital entrepreneurial capability is therefore not limited to technology use, but also reflects creativity, adaptability, and innovation-oriented entrepreneurial behavior in the digital economy ([Abdulmalik et al., 2025](#); [Karimi & Walter, 2021](#)). By positioning entrepreneurial competence as a mediating construct, this study integrates economic education, digital entrepreneurship, and business innovation into a competence-based

framework. This framework strengthens the view that students' innovation capability depends on their ability to convert economic knowledge and digital entrepreneurial exposure into practical business innovation.

Practical Implications

The findings suggest that universities should integrate economic education with digital entrepreneurship more systematically in entrepreneurship curricula. Since economic education does not directly improve business innovation, learning activities should not only emphasize theoretical understanding but also develop students' ability to apply economic knowledge through practical entrepreneurial and digital business experiences.

Higher education institutions should strengthen competence-based and experiential learning through project-based learning, digital business simulations, startup development projects, business mentoring, and collaboration with digital industries. Lecturers can also use digital platform-based assignments, online marketing projects, and business prototype development to help students connect economic analysis with digital technology. These activities are important because entrepreneurial competence is the key mechanism that links economic education and digital entrepreneurship with business innovation.

At the policy level, entrepreneurship education should be supported through curricula that combine economic literacy, digital literacy, entrepreneurial competence, and innovation capability. Overall, improving students' business innovation requires not only economic knowledge but also digital entrepreneurial exposure and learning ecosystems that enable students to transform knowledge into practical innovation.

CONCLUSION

This study examines the influence of economic education and digital entrepreneurship on entrepreneurial competence and business innovation among students in the context of the digital economy. The findings demonstrate that economic education and digital entrepreneurship both play significant roles in strengthening entrepreneurial competence. However, economic education does not directly influence business innovation, indicating that theoretical economic knowledge alone is insufficient to generate innovation-oriented entrepreneurial outcomes. Instead, entrepreneurial competence functions as the key mechanism through which economic education contributes to business innovation. In contrast, digital entrepreneurship has both direct and indirect effects on business innovation, indicating that the ability to leverage digital technologies and platforms is increasingly important for fostering innovation in the digital economy.

The findings also confirm that entrepreneurial competence is the most important factor influencing student business innovation. Students with stronger entrepreneurial competence are better able to identify business opportunities, develop innovative ideas, and implement creative business models. Furthermore, the mediation analysis highlights that entrepreneurial competence serves as a strategic bridge connecting educational knowledge and digital entrepreneurial capability with innovation outcomes. These results strengthen the argument that entrepreneurship education in higher education should focus not only on conceptual knowledge but also on competence development and practical entrepreneurial experiences.

Practically, this study suggests that universities should integrate economic education with digital entrepreneurship practices through competence-based and experiential

learning approaches. Higher education institutions are encouraged to implement project-based learning, digital business simulations, startup incubation programs, and industry collaborations that provide students with direct exposure to digital entrepreneurial ecosystems. In addition, entrepreneurship curricula should incorporate digital platform-based assignments and innovation-oriented entrepreneurial projects to strengthen students' entrepreneurial competence and innovation capability.

Overall, this study contributes to the literature by providing an integrated framework that links economic education, digital entrepreneurship, entrepreneurial competence, and business innovation in the context of the digital economy. The study emphasizes that sustainable business innovation among students is shaped not only by educational knowledge and the use of digital technology, but, more importantly, by the entrepreneurial competencies developed through integrated educational and digital entrepreneurial experiences.

LIMITATION

When analyzing the results of this study, it is important to take into account its various limitations. First, the results may not be as applicable to students in other academic fields because the respondents were restricted to students enrolled in business and economics-related study programs. Second, the study used a quantitative survey approach, which explains correlations between variables but falls short of capturing the fundamental mechanisms underlying the growth of business innovation and entrepreneurial competence. Third, the research model did not incorporate other pertinent elements in the context of the digital economy, such as digital literacy, entrepreneurial attitude, innovation ecosystem, and entrepreneurial intention. Instead, the study concentrated solely on a few key characteristics.

It is therefore advised that future research employ mixed-methods or longitudinal approaches, incorporate additional factors related to digital entrepreneurial ecosystems and innovation capability, and include a wider range of respondent groups. A more thorough knowledge of how education, digital entrepreneurship, and entrepreneurial competence interact to promote sustainable business innovation in the digital economy is anticipated as a result of such initiatives.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare that they do not have a potential conflict of interest related to the research, authorship, and/or publication of this article.

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