

The Contribution of AI-Based Digital Literacy and Entrepreneurial Cognition through Digital Entrepreneurship Education to Entrepreneurial Intention

Iva Khoiril Mala^{1*}, Agung Winarno², Fuad Abdul Fattah³, Rachmad Hidayat⁴
Imanda Nashoikha Dinniyah⁵, Hidayati Suprihatin⁶

Department of Management, Faculty of Economics and Business, Universitas Negeri Malang, Indonesia

Corresponding Author: Iva Khoiril Mala iva.mala.feb@um.ac.id

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ABSTRACT

AI development is transforming entrepreneurship education into a more adaptive digital approach for strengthening students' entrepreneurial intention. This study examines the contribution of AI-based Digital Literacy and Entrepreneurial Cognition through Digital Entrepreneurship Education. Using a quantitative explanatory design, data were collected from 210 students out of a population of 460 who were enrolled in digital entrepreneurship courses. The data were gathered through a 1–7 Likert scale questionnaire and analyzed using SEM-PLS. The findings show that Digital Literacy and Entrepreneurial Cognition positively and significantly influence Digital Entrepreneurship Education and Entrepreneurial Intention. Digital Entrepreneurship Education also significantly affects Entrepreneurial Intention and mediates both relationships, highlighting its role in enhancing students' entrepreneurial interest in the AI-driven digital era.

INTRODUCTION

AI-based digital technology has brought significant changes to the global entrepreneurial landscape. AI is not only transforming the way businesses are run but also influencing the competencies that aspiring entrepreneurs, particularly the younger generation in higher education, must possess. Therefore, entrepreneurship education in the digital era is required to transform from a conventional approach to Digital Entrepreneurship Education, integrated with the strategic use of digital technology and AI (Udoh, 2024) , (Davenport, 2021) , and (Budiyanti, 2021) . In the context of higher education, entrepreneurial intention is seen as a key indicator of the success of entrepreneurship education, as it is the strongest predictor of actual entrepreneurial behavior (Mei et al., 2020) (Boldureanu, 2020) . However, various studies over the past five years have shown that the influence of entrepreneurship education on students' entrepreneurial intention is inconsistent and tends to be indirect (Damarwulan et al., 2021) (Soerianata, 2022) . This indicates that certain internal mechanisms mediate the relationship between entrepreneurship learning and the formation of entrepreneurial intention. One of the important mechanisms in AI-based digital entrepreneurship is digital literacy. Digital literacy is no longer understood simply as the ability to use technology, but includes students' abilities to access, evaluate, manage, and utilize digital technology, including AI, for productive and entrepreneurial purposes (Almansour, 2022) , (Abad-Segura, 2019) , and (Mozahem & Adlouni, 2021) . Integrated digital literacy with utilization of AI contributes to improvement creativity , problem solving problems , and readiness student in face opportunity digital business (Ratten & Usmanij, 2021) (. et al., 2021) . However, most studies still position digital literacy as a supporting skill, not as an independent variable explaining how Digital Entrepreneurship Education influences entrepreneurial intention (Omar, 2019) (Jena, 2020) .

In addition to digital literacy, entrepreneurial cognition is also a crucial factor in shaping entrepreneurial intentions. Entrepreneurial cognition refers to the typical entrepreneurial mindset, such as the ability to recognize opportunities, think innovatively, assess risks, and make decisions under conditions of uncertainty. Recent empirical studies have shown that these cognitive factors have a significant influence on students' entrepreneurial intentions (Mala et al., 2019) (Saraih et al., 2018) . In the context of AI-based learning, entrepreneurial cognition has the potential to develop through exposure to digital data, AI-based business simulations, and technology-assisted business opportunity analysis (Alenezi, 2024) (Hsieh, 2019) . However, studies integrating AI-based entrepreneurial cognition into digital entrepreneurship education are still relatively limited.

Several recent studies confirm that Digital Entrepreneurship Education that adopts digital technology and AI can improve the quality of entrepreneurship learning, especially when such learning encourages exploratory and problem-solving-based learning experiences (Pergelova, 2019) (Rippa, 2019) . However, there is still little research that simultaneously examines the role of Digital Literacy and AI-based Entrepreneurial Cognition as a

mediating mechanism in the relationship between Digital Entrepreneurship Education and students' Entrepreneurial Intention.

Based on this description, it can be concluded that there is a research gap regarding how AI-based Digital Entrepreneurship Education contributes to the formation of students' entrepreneurial intentions by improving digital literacy and entrepreneurial cognition. Therefore, this study is important to provide empirical evidence regarding the contribution of these two variables as mediators, while also enriching the study of digital and AI-based entrepreneurship management education in higher education.

LITERATURE REVIEW

Digital Literacy and Entrepreneurial Intention

The rapid advancement of digital technologies has fundamentally transformed entrepreneurial activities, requiring individuals to possess competencies that extend beyond basic technological skills. Digital literacy is increasingly recognized as a multidimensional capability encompassing the ability to access, evaluate, manage, create, and communicate information through digital technologies. Rather than merely operating digital devices, digitally literate individuals are capable of using technology strategically to solve problems, generate innovative ideas, and support value creation in business environments. In the context of higher education, digital literacy equips students with the competence to navigate digital ecosystems, utilize artificial intelligence (AI)-based applications, and adapt to emerging business opportunities in the digital economy.

Previous studies have consistently reported that digital literacy positively influences entrepreneurial behaviour. Individuals with stronger digital competencies tend to demonstrate greater confidence in identifying market opportunities, utilizing digital platforms, and adopting innovative business models. Digital literacy also facilitates opportunity recognition by enabling access to extensive market information and customer insights through digital technologies. Abad-Segura (2019) argues that digital competence has become an essential component of entrepreneurial capability, while Jena (2020) found that students with higher digital literacy exhibit stronger entrepreneurial intentions. Similarly, Omar (2019) and Mozahem and Adlouni (2021) emphasize that digital competence enhances entrepreneurial readiness by improving information processing, decision-making, and technology utilization. Therefore, digital literacy is expected to strengthen entrepreneurial intention among university students.

H1: Digital Literacy positively influences Entrepreneurial Intention.

Entrepreneurial Cognition and Entrepreneurial Intention

Entrepreneurial cognition refers to the cognitive structures and mental processes that individuals employ when identifying opportunities, evaluating uncertainty, and making entrepreneurial decisions. According to Mitchell et al. (2002), entrepreneurial cognition explains why entrepreneurs interpret information differently from non-entrepreneurs, enabling them to recognize opportunities that others often overlook. This perspective suggests that

entrepreneurial behaviour is largely determined by cognitive capability rather than by external resources alone.

The emergence of artificial intelligence has further increased the importance of entrepreneurial cognition. Although AI can generate extensive business intelligence and predictive analytics, entrepreneurs remain responsible for interpreting information, evaluating alternatives, and making strategic decisions. Consequently, entrepreneurial cognition enables individuals to transform digital information into innovative business ideas and sustainable competitive advantages.

Empirical evidence supports the significant relationship between entrepreneurial cognition and entrepreneurial intention. Baron (2004) argues that opportunity recognition and innovative thinking are fundamental cognitive characteristics of successful entrepreneurs. Likewise, Mala et al. (2019) and Saraih et al. (2018) demonstrate that entrepreneurial cognition significantly predicts students' entrepreneurial intention by enhancing creativity, confidence, and opportunity evaluation. These findings suggest that stronger entrepreneurial cognition is associated with a greater willingness to pursue entrepreneurial careers.

H2: Entrepreneurial Cognition positively influences Entrepreneurial Intention.

Digital Entrepreneurship Education

Digital Entrepreneurship Education represents the evolution of entrepreneurship education in response to digital transformation and the increasing integration of artificial intelligence into business activities. Unlike traditional entrepreneurship education, digital entrepreneurship education emphasizes experiential learning through digital business projects, technology-based problem solving, digital platform utilization, and AI-assisted entrepreneurial decision-making.

From the perspective of Human Capital Theory, education enhances individuals' knowledge and competencies, thereby increasing their productivity and economic value. In entrepreneurship education, learning experiences enable students to develop entrepreneurial knowledge, practical skills, and confidence necessary to establish new ventures. As digital technologies become increasingly embedded in entrepreneurial ecosystems, entrepreneurship education must also evolve to incorporate digital innovation, AI applications, and technology-enabled business models.

Previous studies consistently indicate that entrepreneurship education contributes to entrepreneurial intention. Mei et al. (2020) reported that entrepreneurship education significantly increases students' entrepreneurial intention by improving entrepreneurial competencies and self-confidence. Similarly, Boldureanu (2020) and Ratten and Usmanij (2021) argue that entrepreneurship education should shift toward digital-oriented learning environments that encourage innovation, creativity, and technological adaptability. Consequently, Digital Entrepreneurship Education is expected to directly strengthen Entrepreneurial Intention while simultaneously facilitating the development of digital literacy and entrepreneurial cognition.

H3: Digital Entrepreneurship Education positively influences Entrepreneurial Intention.

H4: Digital Literacy positively influences Digital Entrepreneurship Education.

H5: Entrepreneurial Cognition positively influences Digital Entrepreneurship Education.

Digital Entrepreneurship Education

Recent entrepreneurship research increasingly recognizes that entrepreneurship education functions not merely as an independent predictor but also as a mechanism through which individual competencies are translated into entrepreneurial behaviour. In digitally enabled learning environments, Digital Entrepreneurship Education provides opportunities for students to integrate technological competencies with entrepreneurial thinking through project-based learning, business simulations, digital marketing activities, and AI-supported opportunity analysis.

Students possessing strong digital literacy are generally more capable of engaging with technology-enhanced learning activities and applying digital tools in entrepreneurial contexts. Likewise, students with advanced entrepreneurial cognition are more likely to benefit from entrepreneurship education because they possess the cognitive capacity to recognize opportunities, evaluate business alternatives, and develop innovative solutions. Therefore, Digital Entrepreneurship Education is expected to strengthen the influence of both Digital Literacy and Entrepreneurial Cognition on Entrepreneurial Intention.

Despite growing interest in digital entrepreneurship, relatively few studies have simultaneously examined Digital Literacy and Entrepreneurial Cognition within an AI-supported educational framework. This study addresses that gap by proposing Digital Entrepreneurship Education as a mediating mechanism linking students' digital competence and entrepreneurial cognition to entrepreneurial intention. The proposed framework extends previous entrepreneurship education research by integrating AI-enabled learning into the entrepreneurial intention formation process.

H6: Digital Entrepreneurship Education mediates the relationship between Digital Literacy and Entrepreneurial Intention.

H7: Digital Entrepreneurship Education mediates the relationship between Entrepreneurial Cognition and Entrepreneurial Intention.

METHODOLOGY

This study uses a quantitative approach with an explanatory research method, as it aims to explain the causal relationship between the variables studied: Digital Entrepreneurship Education, Digital Literacy, Entrepreneurial Cognition, and Entrepreneurial Intention. The quantitative approach was chosen to obtain measurable and objective empirical evidence regarding the mechanisms by which digital entrepreneurship learning contributes to the formation of students' entrepreneurial intentions by strengthening their competencies and internal readiness.

This study was designed to test a mediation model, which allows researchers to explain the process by which Digital Entrepreneurship Education

not only directly influences Entrepreneurial Intention but also indirectly through increased Digital Literacy and Entrepreneurial Cognition. With this model, the study was able to uncover the role of students' internal mechanisms in translating digital entrepreneurship learning experiences into entrepreneurial career readiness and orientation.

The population in this study was university students currently or previously taking digital entrepreneurship courses. This population was selected based on the consideration that these students had acquired learning experiences relevant to the Digital Entrepreneurship Education variables studied, thus enabling them to provide an objective assessment of the learning process and its impact on entrepreneurial intentions.

The sampling technique used was purposive sampling, with the following respondent criteria:

1. Active undergraduate students (S1);
2. Students who are currently taking digital entrepreneurship courses;
3. Students have experience using digital technology in the context of learning or entrepreneurial activities;

Based on preliminary data from the business education program administrator, the estimated number of students meeting these criteria is 460. Therefore, the sample size was determined using a *sample size calculator*.

Sample Size Calculator

Find Out The Sample Size

This calculator computes the minimum number of necessary samples to meet the desired statistical constraints.

Result

Sample size: 210

This means 210 or more measurements/surveys are needed to have a confidence level of 95% that the real value is within $\pm 5\%$ of the measured/surveyed value.

Confidence Level:	95%	
Margin of Error:	5	%
Population Proportion:	50	% Use 50% if not sure
Population Size:	460	Leave blank if unlimited population size.

Calculate **Clear**

Figure 2. Research Sample

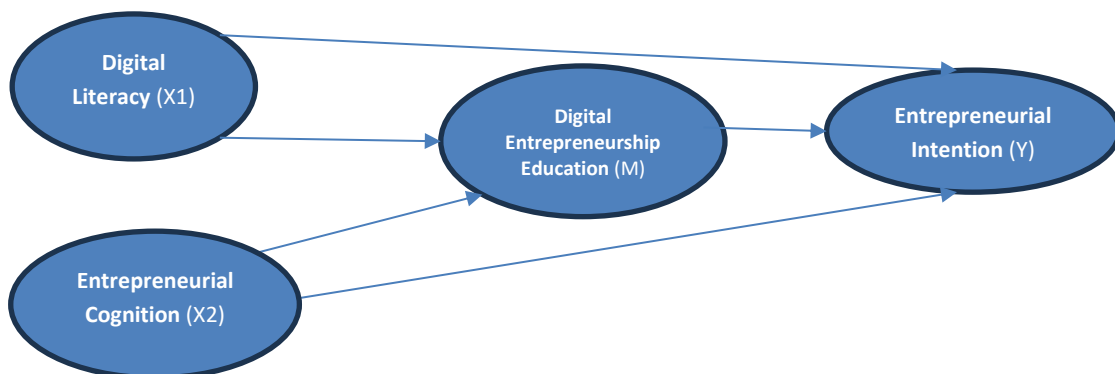


Figure 3. Research Flowchart

The main instrument used in this study was a Likert-scale questionnaire with a range of 1–7 (strongly disagree, disagree, somewhat agree, quite agree, somewhat disagree, agree and strongly agree). The questionnaire was compiled based on the theoretical constructs of the research variables as follows:

Table 1. theoretical constructs of the research variables

Variables	Indicator	Source
Digital Literacy (X1)	Ability to access digital information; ability to evaluate the credibility of digital information; ability to manage digital information; use of digital technology for productive and business activities; use of digital platforms for entrepreneurship; understanding of digital ethics and security	van Laar et al. (2020); Suryani & Chaniago (2023); Maulia et al. (2025)
Entrepreneurial Cognition (X2)	Ability to recognize business opportunities (<i>opportunity recognition</i>); creative and innovative thinking; courage to take calculated risks (<i>risk propensity</i>); business problem-solving ability; value creation orientation; confidence in entrepreneurial decision-making	Mitchell et al. (2002); Baron (2004); Suanpong et al. (2025)
Digital Entrepreneurship Education (M)	Understanding the concept of digital entrepreneurship; digital project/case-based learning; utilization of digital technology in learning; opportunities for digital business practice; development of creativity and innovation; relevance of the material to the dynamics of digital business	Ratten (2020); Nabi et al. (2017); Boubker et al. (2022)
Entrepreneurial Intention (Y)	Strong desire to start a business; preference for entrepreneurship as a career choice; commitment to becoming an entrepreneur; willingness to allocate time and resources; concrete plans to start a business after graduation	Ajzen (1991); Liñán & Chen (2009); Krueger (2007)

The instrument was tested for validity and reliability empirically at the initial stage using the SEM method with the assistance of SmartPLS 3.0 software. The instrument's metric quality was assessed based on strict evaluation criteria, where each indicator item was required to have a *loading factor value* above 0.70 and a *Cronbach's Alpha value* above 0.70 to ensure the reliability of the collected data.

Data analysis in this study uses *Partial Least Squares* (SEM-PLS) to test the structural model (*inner model*) and prove the hypothesis of the relationship between variables. The SEM-PLS analysis procedure is carried out systematically through three main stages, namely evaluation of *the measurement model* (outer model) to assess the validity and reliability of the construct, evaluation of *the structural model* (inner model) to test the strength of the influence between variables, and testing the mediation effect of *the Digital Entrepreneurship Education variable* using the *bootstrapping method*. Significance testing looks at the influence between variables in the structural model evaluated based on the *R-squared value indicator*, *path coefficient*, *t-statistics*, and *p-value*. The results of this analysis are aimed at providing practical implications related to strategies for strengthening digital entrepreneurship education in accelerating entrepreneurial motivation among students.

RESEARCH RESULT

The results of this research can be seen in the inner and outer models below. The results of the inner model based on the construct reliability analysis are shown in Table 2 below.

Table 2. Construct Reability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Digital Entrepreneurship Education (M)	0.886	0.888	0.921	0.745
Digital Literacy (X1)	0.806	0.828	0.872	0.630
Entrepreneurial Cognition (X2)	0.843	0.848	0.894	0.679
Entrepreneurial Intention (Y)	0.888	0.892	0.923	0.749

Based on the results of table 2. Explains that all constructs show excellent internal consistency. *Digital Entrepreneurship Education* has a Cronbach's Alpha of 0.886 and a Composite Reliability of 0.921, while *Digital Literacy* , *Entrepreneurial Cognition* have a Cronbach's Alpha value of 0.843 and a Composite Reliability of 0.894, and *Entrepreneurial Intention* has a Cronbach's Alpha of 0.888 recording a Composite Reliability value of 0.892. These values exceed the recommended threshold of 0.70, which confirms the strong reliability of the construct. The results of this study show that the Average Variance Extracted (AVE) value has a value above 0.70 for all constructs. This indicates that each construct explains more than half of the variance of its indicators, thus establishing adequate convergent validity. Overall, the measurement model demonstrated satisfactory reliability and validity, confirming that the indicators effectively represent the underlying constructs and are suitable for further structural model evaluation.

Table 3. R²

	R Square	R Square Adjusted
Digital Entrepreneurship Education (M)	0.641	0.638
Entrepreneurial Intention (Y)	0.599	0.593

Based on Table 3, the results of the structural model evaluation show that the R² value for Digital Entrepreneurship Education (M) is 0.641 and the Adjusted R² is 0.638. This finding indicates that 64.1% of the variation in Digital Entrepreneurship Education can be explained by Digital Literacy and Entrepreneurial Cognition, while the remaining 35.9% is influenced by other factors outside the research model. Based on the criteria of Hair et al. (2022), the R² value of 0.641 is included in the moderate to strong category, so it can be concluded that Digital Literacy and Entrepreneurial Cognition are quite strong predictors in explaining the quality of AI-based digital entrepreneurship learning received by students. These results show that the higher the digital literacy skills and entrepreneurial cognitive capacity of students, the more effective the implementation of Digital Entrepreneurship Education they perceive.

The R² value for Entrepreneurial Intention (Y) is 0.599 with an Adjusted

R^2 of 0.593. These results indicate that 59.9% of the variation in Entrepreneurial Intention can be explained simultaneously by Digital Literacy, Entrepreneurial Cognition, and Digital Entrepreneurship Education, while the remaining 40.1% is influenced by other variables not included in the research model. This value indicates a fairly good predictive ability of the model in explaining the formation of students' entrepreneurial intentions. This finding strengthens the argument that the development of entrepreneurial intentions in the digital era is not only influenced by the entrepreneurial learning process alone, but also by students' ability to utilize digital technology and develop an entrepreneurial mindset that is adaptive to the development of AI.

Table 4. F^2

	Digital Entrepreneurship Education (M)	Digital Literacy (X1)	Entrepreneurial Cognition (X2)	Entrepreneurial Intention (Y)
Digital Entrepreneurship Education (M)				0.095
Digital Literacy (X1)	0.220			0.108
Entrepreneurial Cognition (X2)	0.338			0.254
Entrepreneurial Intention (Y)				

Based on table 5. It shows that the results (F^2) were carried out to determine the magnitude of the contribution of each exogenous variable to the endogenous variable in the research model.

The results show that the influence of digital literacy on digital entrepreneurship education has an F^2 value of 0.220. Based on Cohen's (1988) classification, this value is included in the medium effect category. This means that students' ability to access, evaluate, and utilize digital technology makes a significant contribution to improving the quality of digital entrepreneurship learning. Students with a high level of digital literacy tend to more easily understand technology-based entrepreneurship material and are able to utilize various digital platforms and AI in the learning process.

The influence of Entrepreneurial Cognition on Digital Entrepreneurship Education has an F^2 value of 0.338, which is categorized as a large effect. This finding indicates that an entrepreneurial mindset that includes the ability to recognize opportunities, think creatively, take calculated risks, and solve business problems is a dominant factor that shapes the effectiveness of digital entrepreneurship learning. In other words, the success of Digital Entrepreneurship Education is largely determined by students' cognitive readiness to understand and internalize technology-based entrepreneurial concepts.

The effect of digital literacy on entrepreneurial intention has an F^2 value of 0.108, which is considered a small effect. Despite its significant effect, the direct contribution of digital literacy to entrepreneurial intention is relatively lower compared to other variables. This result indicates that the ability to use digital

technology alone is not enough to encourage students to choose a career as an entrepreneur, but it remains an important foundation in supporting digital entrepreneurial activities.

The influence of Entrepreneurial Cognition on Entrepreneurial Intention showed an F^2 value of 0.254, which is in the medium effect category. This finding confirms that the cognitive aspect of entrepreneurship plays a stronger role than digital literacy in shaping students' entrepreneurial intentions. The greater students' ability to identify business opportunities, assess risks, and make business decisions, the higher their tendency to choose entrepreneurship as a future career option.

The effect of Digital Entrepreneurship Education on Entrepreneurial Intention has an F^2 value of 0.095, which is categorized as a small effect. This result indicates that digital entrepreneurship learning has a positive contribution to increasing entrepreneurial intention, although the magnitude of the direct effect is relatively limited. This finding indicates that the effectiveness of digital entrepreneurship education in increasing entrepreneurial intention works more through strengthening students' internal competencies, especially Digital Literacy and Entrepreneurial Cognition, as evidenced by the results of the previous mediation test.

Table 5. Discriminant Validity

	Digital Entrepreneurship Education (M)	Digital Literacy (X1)	Entrepreneurial Cognition (X2)	Entrepreneurial Intention (Y)
Digital Entrepreneurship Education (M)	0.863			
Digital Literacy (X1)	0.721	0.794		
Entrepreneurial Cognition (X2)	0.750	0.691	0.824	
Entrepreneurial Intention (Y)	0.698	0.573	0.745	0.866

Based on the results in Table 6, the Digital Entrepreneurship Education (M) construct has a square root AVE value of 0.863, which is higher than its correlation with Digital Literacy (0.721), Entrepreneurial Cognition (0.750), and Entrepreneurial Intention (0.698). These results indicate that the indicators used are better able to explain the Digital Entrepreneurship Education construct than other constructs, thus meeting the discriminant validity criteria. The Digital Literacy (X1) construct obtained a square root AVE value of 0.794, which is higher than its correlation with Digital Entrepreneurship Education (0.721), Entrepreneurial Cognition (0.691), and Entrepreneurial Intention (0.573). These findings indicate that the Digital Literacy construct has different characteristics and can be empirically distinguished from other constructs in the research model. The Entrepreneurial Cognition construct (X2) has a square root AVE value of 0.824, which is greater than its correlation with Digital Entrepreneurship Education (0.750), Digital Literacy (0.691), and Entrepreneurial Intention (0.745). Although the relationship between Entrepreneurial Cognition and

Entrepreneurial Intention is relatively strong, the higher square root AVE value indicates that the two constructs still have clear conceptual and empirical differences. The Entrepreneurial Intention construct (Y) obtained a square root AVE value of 0.866, which is higher than its correlation with Digital Entrepreneurship Education (0.698), Digital Literacy (0.573), and Entrepreneurial Cognition (0.745). These results indicate that the Entrepreneurial Intention indicators consistently measure the intended construct and do not experience measurement overlap with other constructs.

Based on the analysis results above, all diagonal values in the Fornell-Larcker matrix (0.863; 0.794; 0.824; and 0.866) are proven to be higher than all correlation values between constructs in the same row and column. Thus, it can be concluded that all constructs in this study have met the criteria of discriminant validity, so that each variable, namely Digital Literacy, Entrepreneurial Cognition, Digital Entrepreneurship Education, and Entrepreneurial Intention, is able to measure different concepts empirically and there is no overlap problem between constructs.

These findings strengthen the quality of the measurement model used in the study on the contribution of AI-based Digital Literacy and Entrepreneurial Cognition through Digital Entrepreneurship Education to students' Entrepreneurial Intention. Good discriminant validity indicates that the significant relationships found in the structural model truly represent the influence between different constructs, not due to similarities in measurement between variables. Therefore, the results of the hypothesis testing showing the influence of Digital Literacy and Entrepreneurial Cognition on Digital Entrepreneurship Education and Entrepreneurial Intention can be interpreted more convincingly and have a high level of confidence.

Table 6. Fit Model

	Saturated Model	Estimated Model
SRMR	0.077	0.077
d_ ULS	0.798	0.798
d_ G	0.383	0.383
Chi-Square	461,233	461,233
NFI	0.805	0.805

The results of the model fit test in Table 7 show that the SRMR (Standardized Root Mean Square Residual) value is obtained of 0.077 in both the Saturated Model and the Estimated Model. According to Hair et al. (2022), an SRMR value below the 0.08 limit indicates level good model fit (*good fit*). With Thus, a research model that connects Digital Literacy, Entrepreneurial Cognition, Digital Entrepreneurship Education, and Entrepreneurial Intention can be stated own low residual level, so difference between matrix the observed and predicted correlations by the relative model small. Value d_ ULS (Squared Euclidean Distance) of 0.798 and d_ G (Geodesic Distance) of 0.383 indicate that difference between empirical models with theoretical models be at a level that can accepted. These results indicate that the structure of the relationships between variables developed in the study has been able to adequately describe

the relationship patterns that occur in the empirical data.

The Chi-Square value of 461.233 indicates a measure of absolute mismatch between the model and the observed data. In the PLS-SEM approach, the Chi-Square indicator is not the primary criterion in determining model suitability because this method is more oriented towards predictive ability than covariance reproduction. Therefore, model interpretation focuses more on the SRMR and NFI indicators, which are more relevant for PLS model evaluation.

The Normed Fit Index (NFI) value of 0.805 indicates that the constructed model is able to explain approximately 80.5% of the improvement in model fit compared to the null model. According to SEM-PLS literature, an NFI value approaching or exceeding 0.80 can be categorized as an adequate level of model fit (*acceptable fit*), while a value approaching 0.90 indicates an excellent model. Thus, the NFI value of 0.805 indicates that the research model has met an acceptable level of fit for testing structural relationships between variables.

Overall, the results of the model fit evaluation indicate that the research model has a good level of fit with the empirical data. The SRMR value of 0.077 (<0.08) indicates *a good fit*, while the NFI value of 0.805 indicates *an acceptable fit*. Supported by the relatively low d_ULS and d_G values, these findings confirm that the conceptual model explaining the relationship between Digital Literacy, Entrepreneurial Cognition, Digital Entrepreneurship Education, and Entrepreneurial Intention has met the model feasibility criteria in its analysis. Therefore, the research model can be declared suitable for use in interpreting the results of hypothesis testing and explaining the mechanism of contribution of AI-based Digital Literacy and Entrepreneurial Cognition through Digital Entrepreneurship Education to the formation of students' Entrepreneurial Intention.

Table 7. *Path Coefficients*

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Digital Entrepreneurship Education (M) -> Entrepreneurial Intention (Y)	0.326	0.337	0.089	3,649	0,000
Digital Literacy (X1) -> Digital Entrepreneurship Education (M)	0.388	0.390	0.077	5,070	0,000
Digital Literacy (X1) -> Entrepreneurial Intention (Y)	0.414	0.498	0.080	0.177	0,000
Entrepreneurial Cognition (X2) -> Digital Entrepreneurship Education (M)	0.482	0.481	0.067	7,217	0,000
Entrepreneurial Cognition (X2) ->	0.510	0.497	0.109	4,693	0,000

Entrepreneurial Intention (Y)					
Digital Literacy (X1) -> Digital Entrepreneurship Education (M) -> Entrepreneurial Intention (Y)	0.127	0.130	0.042	3,042	0.002
Entrepreneurial Cognition (X2) -> Digital Entrepreneurship Education (M) -> Entrepreneurial Intention (Y)	0.157	0.163	0.051	3,058	0.002

Based on Table 7, the results of the path coefficient analysis indicate that all direct and indirect relationships in the model have p-values below 0.05, thus all research hypotheses are accepted. The following are the results of the analysis based on Hypotheses 1 to 7.

H1: The Influence of Digital Entrepreneurship Education on Entrepreneurial Intention

The analysis results show that Digital Entrepreneurship Education has a positive and significant effect on Entrepreneurial Intention with a path coefficient value of $\beta = 0.326$, t-statistics = 3.649, and p-value = 0.000. This finding indicates that the better the implementation of AI-based digital entrepreneurship learning, the higher the student's intention to become an entrepreneur. These results support the Human Capital Theory, which explains that education is an important investment in improving an individual's ability to create economic opportunities in the future. This finding is also in line with research by Mei et al. (2020), Boldureanu (2020), and Ratten & Usmanij (2021), which found that entrepreneurship education can increase entrepreneurial interest by increasing knowledge, experience, and readiness to face the digital business world. In the context of this research, Digital Entrepreneurship Education not only provides conceptual understanding but also introduces students to the use of digital technology and AI as a means of business development.

H2: The Influence of Digital Literacy on Digital Entrepreneurship Education

The test results show that Digital Literacy has a positive and significant effect on Digital Entrepreneurship Education with a β value of 0.388, t-statistics = 5.070, and p-value = 0.000. This finding indicates that students who have high abilities in accessing, evaluating, managing, and utilizing digital information tend to be more able to follow and optimize the digital entrepreneurship learning process. This finding supports the views of Abad-Segura (2019) and Almansour (2022) who emphasized that digital literacy is a fundamental competency in the success of technology-based entrepreneurship education. In the AI era, students are not only required to be able to use technology, but also to understand how

this technology can be utilized to identify business opportunities and create entrepreneurial innovation.

H3: The Influence of Digital Literacy on Entrepreneurial Intention

The analysis results show that Digital Literacy has a positive and significant effect on Entrepreneurial Intention with a β value of 0.414, p-value = 0.000. Although there are indications of inconsistencies in the t-statistics values listed in the table, the p-value indicates that the relationship is statistically significant. This finding indicates that students' ability to utilize digital technology and AI productively can increase their confidence in entering the world of entrepreneurship. Students with high levels of digital literacy tend to have easier access to market information, understand digital business trends, utilize e-commerce platforms, and use AI technology to support business decision-making. These results are in line with research by Jena (2020), Omar (2019), and Mozahem & Adlouni (2021), which found that digital literacy plays a crucial role in increasing individual readiness for entrepreneurship in the digital economy.

H4: The Influence of Entrepreneurial Cognition on Digital Entrepreneurship Education

The test results show that Entrepreneurial Cognition has a positive and significant effect on Digital Entrepreneurship Education with a β value of 0.482, t-statistics = 7.217, and p-value = 0.000. This coefficient value is one of the largest in the research model, indicating that an entrepreneurial mindset is a dominant factor in students' success in participating in digital entrepreneurship learning. Students who have the ability to recognize business opportunities, think creatively, take measured risks, and solve business problems tend to more easily understand technology- and AI-based learning materials. This finding supports the Entrepreneurial Cognition Theory developed by Mitchell et al. (2002) and is strengthened by research by Baron (2004) and Suanpong et al. (2025) which explains that the success of entrepreneurship learning is greatly influenced by individual cognitive processes in interpreting business information and market opportunities.

H5: The Influence of Entrepreneurial Cognition on Entrepreneurial Intention

The results of the study indicate that Entrepreneurial Cognition has a positive and significant effect on Entrepreneurial Intention with a β value of 0.510, t-statistics of 4.693, and p-value of 0.000. This coefficient value has the largest direct influence on Entrepreneurial Intention compared to other variables. These findings indicate that the ability to think like an entrepreneur is a major factor determining students' intention to build a business in the future. These results are consistent with research by Mala et al. (2019) and Saraih et al. (2018) which found that the ability to recognize opportunities, value creation orientation, creativity, and the courage to take risks are strong predictors in the formation of entrepreneurial intentions. In the context of AI, cognitive abilities enable students to utilize digital information and AI-based analytics to find new business opportunities more effectively.

H6: The Mediation Role of Digital Entrepreneurship Education in the Relationship between Digital Literacy and Entrepreneurial Intention

The analysis results show that the indirect path of Digital Entrepreneurship mediates Digital Literacy towards Education Entrepreneurial Intention with a value of $\beta = 0.127$, t -statistics = 3.042, and p -value = 0.002. These results prove that Digital Entrepreneurship Education is able to significantly mediate the influence of Digital Literacy towards Entrepreneurial Intention. This finding indicates that digital literacy not only influences entrepreneurial intention directly, but also through the digital entrepreneurship learning experience obtained by students. In other words, the higher the digital literacy of students, the more effectively they utilize the AI-based entrepreneurship learning process, which ultimately increases entrepreneurial intention.

H7: The Mediation Role of Digital Entrepreneurship Education on the Relationship between Entrepreneurial Cognition and Entrepreneurial Intention

The test results show that the indirect path between Digital Entrepreneurship Education mediating Entrepreneurial Cognition on Entrepreneurial Intention has a value of $\beta = 0.157$, t -statistics = 3.058, and p -value = 0.002. These results confirm that Digital Entrepreneurship Education plays a significant mediator in the relationship between Entrepreneurial Cognition and Entrepreneurial Intention. This mediation coefficient value is greater than the Digital Literacy mediation path ($0.157 > 0.127$), which indicates that entrepreneurial cognitive abilities gain greater strengthening through the digital entrepreneurship learning process. These findings show that students with a strong entrepreneurial mindset will gain greater benefits from Digital Entrepreneurship Education in developing entrepreneurial intentions. The integration of AI in learning provides space for students to develop their opportunity identification, risk analysis, and business decision-making skills more deeply.

Based on the analysis above, there are three main findings that enrich the literature on AI-based digital entrepreneurship. First, Entrepreneurial Cognition is the strongest predictor of Entrepreneurial Intention ($\beta = 0.510$) compared to Digital Literacy ($\beta = 0.414$) and Digital Entrepreneurship Education ($\beta = 0.326$). This finding indicates that the success of creating potential digital entrepreneurs does not only depend on technological mastery, but is more determined by entrepreneurial thinking skills. Second, Digital Entrepreneurship Education is proven to play a significant mediating mechanism in bridging the influence of Digital Literacy and Entrepreneurial Cognition on Entrepreneurial Intention. This finding addresses the research gap identified in the introduction, namely the limited number of studies explaining how digital entrepreneurship education works through students' internal mechanisms. Third, this study provides empirical evidence that the integration of AI in Digital Entrepreneurship Education can strengthen the relationship between digital competence, entrepreneurial cognitive abilities, and students' entrepreneurial intentions. Therefore, the development of entrepreneurship curricula in higher education should not only focus on mastering digital technology, but also on strengthening

an innovative, creative, adaptive, and AI-based entrepreneurial mindset to create new business opportunities. The following image from smartPLS illustrates the evidence for the significance of each direct and indirect hypothesis, as seen in Figure 1.

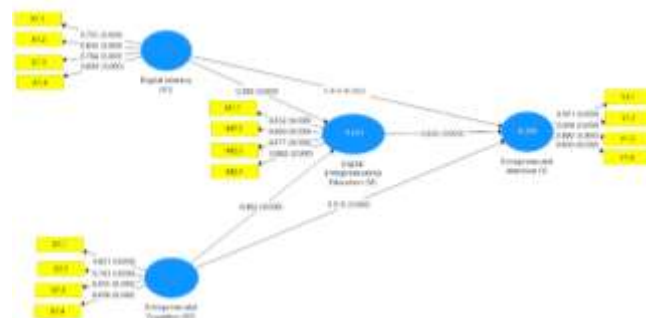


Figure 1. SEM-PLS Bostrapping Results

DISCUSSION

The results of the study show that Digital Literacy, Entrepreneurial Cognition, and Digital Entrepreneurship Education are important factors that contribute to the formation of students' Entrepreneurial Intention in the Artificial Intelligence (AI) era.

The findings of this study demonstrate that the development of digital technology is not only changing the way individuals obtain information but also influencing the mindset formation and career decisions of students. In the context of higher education, students' ability to utilize digital technology and understand business opportunities arising from AI developments is a crucial asset in fostering entrepreneurial interest.

Digital Entrepreneurship Education towards Entrepreneurial Intention shows that existence positive and significant influence in the learning process as well as own role strategic in form orientation entrepreneurship students. Entrepreneurship education that has been This focused on delivery draft business start experience shift going to a more approach applicable through utilization digital technology, simulation business, data analysis, and usage various AI- based platforms. This allows students to gain a learning experience more closely aligned with the realities of the business world. The results of this study reinforce the Human Capital Theory, which positions education as a means of enhancing individual capacity to create economic value. The better the quality of the learning experience students receive, the greater their confidence in engaging in entrepreneurial activities. This finding aligns with research by Mei et al. (2020) and Boldureanu (2020), which explains that entrepreneurship education can increase entrepreneurial interest by developing knowledge, skills, and experience relevant to the needs of the modern business world.

The results of this study found that Digital Literacy has a significant influence on Digital Entrepreneurship Education and Entrepreneurial Intention. These findings indicate that the ability to access, understand, evaluate, and utilize digital information has become a fundamental competency in the contemporary entrepreneurial environment. Students with a good level of digital literacy tend to be more adaptable to various technological innovations used in the learning

process and in business activities. This ability enables them to identify market opportunities, understand digital consumer behavior, and utilize AI technology to support decision-making. These results strengthen the argument that digital literacy is no longer just a technical ability, but a strategic resource that supports the development of entrepreneurship in the digital economy era. However, the results of the study indicate that the influence of Entrepreneurial Cognition on Entrepreneurial Intention is stronger than Digital Literacy. This finding is interesting because it indicates that the success of creating prospective entrepreneurs is not solely determined by the ability to use technology, but is more influenced by how individuals think and view business opportunities. Entrepreneurial Cognition relates to a person's ability to recognize opportunities, interpret business information, evaluate risks, and make decisions in uncertain situations. These skills become increasingly important when individuals are faced with a rapidly evolving business environment driven by advances in AI and digitalization. In such a context, technology serves only as a tool, while decisions about whether to utilize it productively remain dependent on an individual's cognitive capacity.

These findings reinforce the Entrepreneurial Cognition theory developed by Mitchell et al. (2002), which asserts that an individual's mental processes and way of thinking are key factors in explaining entrepreneurial behavior. Students with strong entrepreneurial cognitive abilities tend to more easily recognize opportunities behind technological change. They are not only technology users but also capable of developing new business ideas that utilize technology as a source of competitive advantage. Therefore, the results of this study indicate that increasing digital literacy without strengthening an entrepreneurial mindset does not necessarily result in optimal increases in entrepreneurial intentions.

Another important finding in this study is the mediating role of Digital Entrepreneurship Education. The analysis shows that Digital Entrepreneurship Education is able to bridge the influence of Digital Literacy and Entrepreneurial Cognition on Entrepreneurial Intention. This finding provides a deeper understanding of how students' competencies can be translated into entrepreneurial intentions. Digital entrepreneurship education not only functions as a medium for knowledge transfer but also provides a space for students to integrate digital skills with entrepreneurial thinking skills. Through this learning process, students have the opportunity to test business ideas, understand digital business models, and utilize various AI-based technologies to solve business problems.

The results of the mediation effect of Entrepreneurial Cognition through Digital Entrepreneurship Education are greater than the mediation effect of Digital Literacy. These results indicate that the effectiveness of digital entrepreneurship education is strongly influenced by students' cognitive readiness. Students with a strong entrepreneurial mindset tend to gain greater benefits from the learning process because they are able to connect the knowledge gained with real business opportunities. Conversely, students who only have digital technical skills without being supported by entrepreneurial thinking skills tend to experience difficulties in converting that knowledge into

actions that lead to business activities. These findings indicate that the success of entrepreneurship education depends not only on the use of advanced technology, but also on students' ability to interpret and utilize that technology productively.

Based on the research findings above, this study demonstrates that the formation of Entrepreneurial Intention in the AI era is a process involving the interaction of digital competencies, entrepreneurial cognitive abilities, and learning experiences gained through Digital Entrepreneurship Education. The results indicate that universities need to develop entrepreneurship learning models that are not only oriented towards improving digital skills, but also towards strengthening critical thinking, creativity, opportunity recognition, and business decision-making. This approach is becoming increasingly relevant given that the development of AI has fundamentally changed the business landscape. Therefore, the success of entrepreneurship education in the future will no longer be determined solely by students' ability to master technology, but by their ability to utilize that technology to create value, innovation, and sustainable business opportunities.

CONCLUSIONS AND RECOMMENDATIONS

This study shows that Digital Literacy, Entrepreneurial Cognition, and Digital Entrepreneurship Education are important factors in shaping students' Entrepreneurial Intention in the Artificial Intelligence (AI) era. The analysis results prove that all tested relationships have a positive and significant influence. This finding indicates that the higher students' ability to utilize digital technology and the better their ability to recognize opportunities, evaluate risks, and make business decisions, the higher their tendency to choose entrepreneurship as an alternative career in the future. Furthermore, Digital Entrepreneurship Education has proven to be an effective tool in developing entrepreneurial competencies relevant to the demands of digital transformation.

This study also found that Entrepreneurial Cognition is the factor that has the most dominant influence on Entrepreneurial Intention compared to other variables. This finding confirms that the success of creating prospective entrepreneurs in the digital era is not only determined by technological mastery, but is more influenced by the individual's entrepreneurial thinking skills. Students who are able to identify business opportunities, think creatively, and manage uncertainty tend to have stronger entrepreneurial intentions. On the other hand, Digital Entrepreneurship Education has been shown to act as a mediator that strengthens the influence of Digital Literacy and Entrepreneurial Cognition on Entrepreneurial Intention, making digital entrepreneurship education an important mechanism in transforming student competencies into a real entrepreneurial orientation.

Practically, the results of this study provide implications for universities in designing entrepreneurship learning that focuses not only on improving digital skills but also on developing an innovative, adaptive, and opportunity-creating entrepreneurial mindset. The integration of digital technology and AI into the learning process should be directed at fostering students' analytical skills, creativity, and business decision-making. Thus, universities can produce

graduates who are not only prepared to face technological change but also capable of creating new business opportunities and contributing to the development of a sustainable digital economy.

ADVANCED RESEARCH

This study was limited to undergraduate students from a single university and employed a cross-sectional research design, which may restrict the generalizability of the findings. Future research is encouraged to involve more diverse samples from different higher education institutions and countries, as well as adopt longitudinal or comparative approaches. Further studies may also incorporate additional variables, such as entrepreneurial self-efficacy, AI readiness, or digital innovation capability, to provide a broader understanding of entrepreneurial intention in the context of AI-supported entrepreneurship education.

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REFERENCES

- Abad-Segura, E. (2019). Effects of financial education and financial literacy on creative entrepreneurship: A worldwide research. *Education Sciences*, 9(3).
- Alenezi, A. M. (2024). Integrating the Triple Pillar: AI Marketing's Pathway to Enhancing Industry 5.0 Through Sustainability, Resilience, and Customer Engagement. In *2nd International Conference on Cyber Resilience, ICCR 2024*.
- Almansour, M. (2022). Business Incubators and Entrepreneurial Training: Leveraging Technological Innovations and Digital Marketing. *IEEE Transactions on Engineering Management*.
- Boldureanu, G. (2020). Entrepreneurship education through successful entrepreneurial models in higher education institutions. *Sustainability (Switzerland)*, 12(3). <https://doi.org/10.3390/su12031267>
- Budiyanti, R. T. (2021). *Buku Ajar Internet of Things*.

- Damarwulan, L. M., Ramdansyah, A. D., & Lutfi, L. (2021). Peningkatan Kekuatan Jejaring Wirausaha dan E-Marketing UMKM di Banten dalam menghadapi dampak Pandemic Covid-19. *Journal of Education, Humaniora and Social Sciences (JEHSS)*, 3(3). <https://doi.org/10.34007/jehss.v3i3.495>
- Davenport, T. H. (2021). How to Design an AI Marketing Strategy. *Harvard Business Review*, 2021, 2–7.
- Hsieh, L. (2019). A multidimensional perspective of SME internationalization speed: The influence of entrepreneurial characteristics. *International Business Review*, 28(2), 268–283. <https://doi.org/10.1016/j.ibusrev.2018.09.004>
- Jena, R. K. (2020). Measuring the impact of business management Student's attitude towards entrepreneurship education on entrepreneurial intention: A case study. *Computers in Human Behavior*, 107.
- Mala, I. K., Pratikto, H., & Winarno, A. (2019). The Effect of Familiy Environment, Entrepreneurship Education and Self-Efficacy on Entrepreneurial Intention in Pondok Pesantren At Throughout Malang, Indonesia. *International Journal of Business, Economics and Law*, 20(5).
- Mei, H., Lee, C. H., & Xiang, Y. (2020). Entrepreneurship education and students' entrepreneurial intention in higher education. *Education Sciences*, 10(9).
- Mozahem, N. A., & Adlouni, R. O. (2021). Using entrepreneurial self-efficacy as an indirect measure of entrepreneurial education. In *The International Journal of Management Elsevier*.
- Omar, F. I. (2019). Analysis of digital inclusion pattern and entrepreneurs transformation. *Jurnal Komunikasi: Malaysian Journal of Communication*, 35(2), 314–330. <https://doi.org/10.17576/JKMJC-2019-3502-19>
- Pergelova, A. (2019). Democratizing Entrepreneurship? Digital Technologies and the Internationalization of Female-Led SMEs. *Journal of Small Business Management*, 57(1), 14–39. <https://doi.org/10.1111/jsbm.12494>
- Ratten, V., & Usmanij, P. (2021). Entrepreneurship education: Time for a change in research direction? *International Journal of Management Education*, 19(1).
- Rippa, P. (2019). Digital academic entrepreneurship: The potential of digital technologies on academic entrepreneurship. *Technological Forecasting and Social Change*, 146, 900–911. <https://doi.org/10.1016/j.techfore.2018.07.013>
- Saraih, U. N., Aris, A. Z. Z., Mutalib, S. A., & ... (2018). The influence of self-efficacy on entrepreneurial intention among engineering students.
- S., Nurhayati, S., Wahyu Hidayat, A., Fitri, A., Iqbal Fasa, M., & Azis, A. (2021). The Role of a Community Learning Centre in Fostering the Community's Social Entrepreneurship Character and Motivation in Facing New Normal Era. *KnE Social Sciences*. <https://doi.org/10.18502/kss.v5i8.9354>
- Soerianata, R. M. (2022). Pengaruh Entrepreneurship Education, Financial Support, Dan Market Availability Terhadap Entrepreneurial Attitude. In *Journal of Advances in Digital Business*
- Udoh, F. S. (2024). Search Engine Marketing on the Performance of Small – Medium Enterprises: A Mediating Variable of Culture. In *Studies in Systems Decision and Control* (Vol. 223, pp. 551–566). https://doi.org/10.1007/978-3-031-51997-0_47