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THE IMPACT OF DIGITAL EDUCATION ON THE SUCCESS OF ENTREPRENEURSHIP: EXPLORING THE INTERPLAY BETWEEN ONLINE LEARNING, DIGITAL SELF-EFFICACY, AND ENTREPRENEURIAL INTENTION IN THE DIGITAL ECONOMY

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ABSTRACT

This study investigates the impact of digital education on the success of digital entrepreneurship, focusing on the interplay between online learning, digital self-efficacy, and the entrepreneurial intentions of early-career individuals in the digital economy. By examining how digital education fosters entrepreneurial skills and knowledge, the research identifies the features of digital education that significantly enhance entrepreneurial motives towards digitally driven start-ups, with digital self-efficacy serving as a mediating factor. The facets of online education, digital self-efficacy, and the motivation for digitally driven start-ups among undergraduates were assessed quantitatively using pre-validated instruments. Multivariate analysis revealed the positive influence of online education in fostering entrepreneurial intention, partially mediated by digital self-efficacy. In particular, the personalization, real-time feedback, and Intelligent Interaction of online education play a significant role in fostering digital entrepreneurial motivation. The study findings have significant implications for utilizing online education to mitigate the challenges faced by early-career entrepreneurs. Additionally, leveraging digital self-efficacy can heighten digital entrepreneurial intentions. The findings highlight best practices and suggest improvements in digital education to better support the dynamic needs of digital entrepreneurs. By fostering a robust environment for digital entrepreneurship, these enhanced digital education platforms can significantly contribute to entrepreneurial success.

KEYWORDS

digital education, digital entrepreneurship, digital self-efficacy, online learning platforms, entrepreneurial success, lifelong learning

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INTRODUCTION

The rise of the digital economy has transformed industries, workplaces, and consumer behaviors worldwide. Digital entrepreneurship, which refers to entrepreneurial initiatives that are enabled by or reliant on digital technologies, is a key driver of this transformation (Bican, Brem, 2020). It encompasses businesses that operate primarily in online environments, ranging from e-commerce ventures to platform-based companies and tech start-ups. As traditional industries face digital disruption, there has been a significant shift in how entrepreneurs access resources, interact with markets, and develop innovative solutions (Schaltegger, Wagner, 2011). With this, digital education has emerged as a critical enabler, shaping how individuals acquire the skills, knowledge, and competencies needed to thrive in a digital-first entrepreneurial environment (Prokopenko et al., 2024).

The digital economy is characterized by the pervasive influence of digital technologies, such as the Internet, artificial intelligence, cloud computing, and big data, which have significantly altered traditional business models and entrepreneurial landscapes. The World Bank (2021) defines the digital economy as an ecosystem where economic activity is driven by information and communication technology (ICT), with digital transactions at the core. This has resulted in new opportunities for entrepreneurs to tap into global markets, innovate with lower capital requirements, and leverage digital tools to improve operational efficiencies.

In this context, digital entrepreneurship has gained momentum. Traditional entrepreneurship models relied on physical infrastructure, face-to-face interactions, and brick-and-mortar establishments, but digital entrepreneurship is built around virtual environments, online interactions, and digital platforms (Shevchenko et al., 2023; Radović Marković et.al., 2021a).). For example, companies like Amazon, Airbnb, and Uber are not merely companies that moved into the digital sphere; they are businesses that were born and scaled in the digital economy. The barriers to entry for entrepreneurship have been significantly lowered, thanks to the accessibility of digital tools and platforms that reduce the need for significant upfront capital. Entrepreneurs now have access to tools for creating websites, engaging in digital marketing, leveraging cloud services, and utilizing online learning to upgrade their competencies.

The concept of digital education refers to the process of acquiring knowledge and skills through digital platforms and tools (Alenezi, 2023). These can include massive open online courses (MOOCs), webinars, virtual classrooms, and self-directed online learning platforms. In the digital age, education is no longer confined to traditional physical classrooms; it is now accessible to anyone with an internet connection. The importance of digital education is amplified by the need for entrepreneurs to stay abreast of rapidly evolving technological trends and innovations that influence their ability to adapt, compete, and succeed (Satjharuthai, Lakkhongkha, 2023).

Digital education has been a key driver in enabling potential entrepreneurs to acquire essential digital skills, such as coding, digital marketing, and data analytics, which are increasingly necessary in launching and scaling a digital venture. Additionally, it provides a flexible and cost-effective alternative to traditional education, allowing individuals to pursue entrepreneurship while still maintaining other commitments. According to Khuong et al. (2023), the accessibility of digital education can help bridge the knowledge gap for individuals in developing economies, further democratizing entrepreneurial opportunities in the digital economy.

ONLINE LEARNING IN DIGITAL ENTREPRENEURSHIP

Online learning has emerged as a prominent facet of digital education (Wang et al., 2023). With the increasing number of platforms offering specialized courses on entrepreneurship, coding, finance, and marketing, aspiring digital entrepreneurs are able to access a wealth of resources that can help them launch and scale their businesses.



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The proliferation of platforms such as Coursera, Udemy, LinkedIn Learning, and edX has made high-quality education available to individuals across the globe, offering courses tailored to different aspects of entrepreneurship.

Online learning is not only about gaining knowledge; it also encourages self-paced learning, adaptability, and continuous improvement—skills that are essential for digital entrepreneurs operating in dynamic and competitive markets (Žur, 2020, Karnouskos, 2017). The ability to learn at one's own pace and apply theoretical knowledge to real-world entrepreneurial challenges provides learners with a unique advantage. Furthermore, digital education often incorporates practical aspects, such as capstone projects, business simulations, and peer collaborations, which help learners build real-world skills and networks that can be leveraged in their entrepreneurial journey (Wang et al., 2021).

The effectiveness of online learning is also underscored by its ability to reach underserved populations, providing opportunities for individuals from rural or underdeveloped regions to gain access to high-quality entrepreneurial education (Marope et al., 2015, Radović-Marković et al., 2017). This democratization of knowledge is particularly relevant in a world where digital entrepreneurship is seen as a pathway to economic empowerment and social mobility. According to the Global Entrepreneurship Monitor (2021), individuals who engage in digital entrepreneurship are more likely to succeed if they have access to online learning tools that equip them with the necessary skills and knowledge to navigate the complexities of the digital economy.

DIGITAL SELF-EFFICACY AND ENTREPRENEURIAL SUCCESS

Self-efficacy, a psychological construct introduced by Albert Bandura (1997), refers to an individual's belief in their ability to execute specific tasks and achieve desired outcomes. In the context of digital entrepreneurship, digital self-efficacy refers to the confidence an individual has in their ability to utilize digital tools, platforms, and technologies effectively to drive business success (Primario et al., 2022, Ahmad et al., 2024). This concept is closely linked to entrepreneurial intention, as an individual's belief in their capacity to succeed using digital tools can directly influence their willingness to engage in digital entrepreneurial activities.

Digital self-efficacy plays a critical role in the success of digital entrepreneurship (Ahmad et al., 2024). Entrepreneurs with high digital self-efficacy are more likely to engage with digital platforms, innovate using technological solutions, and persist through challenges associated with the digital economy. Research suggests that individuals with stronger digital self-efficacy are better equipped to adapt to the fast-paced and often volatile nature of digital markets (Amorós et al., 2021). This adaptability is crucial, as digital entrepreneurs are required to make decisions in environments characterized by constant change, emerging technologies, and shifting consumer preferences (Kraus et al., 2019).

Moreover, the relationship between digital self-efficacy and entrepreneurial success is not unidirectional (Jun et al., 2023). Success in entrepreneurial ventures can further bolster an individual's digital self-efficacy, creating a positive feedback loop. For instance, as digital entrepreneurs achieve milestones, such as launching a product or reaching a financial target, their confidence in their ability to use digital tools effectively increases, thereby motivating them to pursue further digital entrepreneurial activities.



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ENTREPRENEURIAL INTENTION IN THE DIGITAL ECONOMY

Entrepreneurial intention refers to an individual's conscious decision to engage in entrepreneurial activities (Tomy, Pardede, 2020). It is widely recognized as a precursor to entrepreneurial behaviour. In the context of the digital economy, entrepreneurial intention is shaped by various factors, including exposure to digital education, digital self-efficacy, access to resources, and market opportunities (Primario et al., 2022). Research on entrepreneurial intention, based on the theory of planned behaviour (Ajzen, 1991), posits that intention is influenced by three primary factors: attitudes toward entrepreneurship, subjective norms, and perceived behavioural control.

Digital education and online learning can significantly impact these factors by altering individuals' perceptions of the feasibility and desirability of starting a digital venture (Wang et al., 2023). Exposure to entrepreneurial content in online courses, coupled with the opportunity to practice digital skills, can shift individuals' attitudes towards digital entrepreneurship, making it a more attractive and attainable career option. Similarly, online communities and networks, which are often embedded in digital learning platforms, serve as subjective norms, where individuals receive encouragement and validation for their entrepreneurial ambitions.

Entrepreneurial intention in the digital economy is also closely tied to the concept of opportunity recognition. Digital entrepreneurs often identify gaps or inefficiencies in digital markets and develop solutions that address these needs. Digital education enhances this ability by providing learners with the analytical tools needed to assess market trends, consumer behavior, and technological advancements (Khuong et al., 2023). As such, individuals with strong entrepreneurial intentions are more likely to leverage their digital education to recognize and capitalize on emerging opportunities.

RESEARCH GAP, THE RELATIVE AND THE OBJECTIVES OF THE STUDY

While substantial research has been conducted on the general relationship between education and entrepreneurship, the specific dynamics between digital education, digital self-efficacy, and entrepreneurial intention in the context of the digital economy remain underexplored (Mir et al., 2023, Al Amimi et al., 2023). The rapid growth of digital entrepreneurship necessitates a deeper understanding of how digital education impacts the entrepreneurial journey and what factors contribute to the success of digital ventures. Moreover, existing literature has largely focused on traditional education and entrepreneurship models (Al-Mamun et al., 2022), leaving a gap in the understanding of how online learning and digital self-efficacy influence entrepreneurial outcomes in a technology-driven world.

Given the importance of digital entrepreneurship as a driver of economic growth, innovation, and job creation, particularly in emerging economies, it is crucial to investigate how digital education can be leveraged to enhance entrepreneurial success. This study aims to explore the interplay between online learning, digital self-efficacy, and entrepreneurial intention, to identify the key determinants of success for digital entrepreneurs.

Based on the background and identified research gaps, this study seeks to unveil, how online learning impacts entrepreneurial intention in the digital economy, the role that digital self-efficacy plays in the success of digital entrepreneurs, and to which extent the interplay between online learning and digital self-efficacy influences entrepreneurial outcomes.



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By addressing these objectives, this study aims to contribute to the growing body of knowledge on digital entrepreneurship and provide insights that can inform educational practices, policy development, and entrepreneurial support programs in the digital economy.

THEORETICAL BACKGROUND

This section presents both the theoretical and current empirical understanding of the primary study variables, serving to justify their inclusion in the conceptual framework.

Digital entrepreneurial intention

Entrepreneurial intention denotes an individual's conscious state of mind aimed at starting a new business venture or engaging in entrepreneurial activities in the future (Bird, 1988). In the digital context, entrepreneurial intention expands to include the desire and motivation to start or engage in entrepreneurial ventures specifically within the digital economy (Davidsson, Wiklund, 2001). Digital entrepreneurial intention (DEI) is a more recent concept that reflects the aspirations of individuals to leverage digital technologies and online platforms to launch entrepreneurial activities. As digitalization reshapes the landscape of entrepreneurship, understanding the drivers behind digital entrepreneurial intentions has become essential for fostering innovation in the digital economy.

The emergence of the digital economy has facilitated new entrepreneurial opportunities, drastically reducing entry barriers for digital startups (Sussan, Acs, 2017, Radović-Marković, 2023). Entrepreneurs no longer rely solely on physical resources to build ventures; instead, they can exploit the growing access to online resources, digital marketplaces, and global audiences. However, the intention to pursue digital entrepreneurship is not merely influenced by the availability of technology – it is also shaped by psychological, educational, and motivational factors.

The concept of entrepreneurial intention has been largely studied using Ajzen's (1991) Theory of Planned Behavior (TPB). TPB posits that an individual's intentions to engage in a specific behavior are determined by three factors: attitudes toward the behavior, subjective norms, and perceived behavioral control (Ajzen, 1991). This framework has been widely applied in entrepreneurship research to explain the formation of entrepreneurial intentions, including in the digital context. In digital entrepreneurship, TPB's core elements adapt to reflect the influence of digital skills and online environments. Attitudes towards digital entrepreneurship are influenced by the perceived ease and scalability of digital businesses, while subjective norms may include pressures or encouragement from online networks and communities. Finally, perceived behavioral control in digital entrepreneurship is often tied to an individual's confidence in their digital competencies and the belief that they can navigate the challenges of digital ventures.

Online learning

Digital education plays a crucial role in fostering digital entrepreneurial intention by equipping individuals with the skills and knowledge required to succeed in digital ventures. The human capital theory (Becker, 1964) suggests that investments in education and training enhance an individual's capabilities, making them more likely to engage in entrepreneurial activities. In the digital era, this theory applies to both formal



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education systems and informal online learning platforms that focus on entrepreneurial and digital skills development.

Recent empirical findings support the idea that digital education positively influences entrepreneurial intention. A study by Solesvik et al. (2021) found that participation in online entrepreneurship courses significantly increased the likelihood of students pursuing digital entrepreneurship. The study revealed that exposure to entrepreneurial concepts and digital tools not only improved participants' skills but also enhanced their confidence in identifying and acting on digital business opportunities. Moreover, online learning platforms provide flexible and accessible learning environments, which are particularly important for fostering entrepreneurial intention in non-traditional learners and working professionals (Martin, 2020).

Beyond traditional online courses, Massive Open Online Courses (MOOCs) have gained prominence as a tool for digital entrepreneurship education. MOOCs allow learners to access high-quality content on digital business creation, marketing, and innovation at minimal cost. A recent study by Markova et al. (2023) concluded that participants in entrepreneurship-related MOOCs demonstrated higher entrepreneurial intentions, driven by the knowledge acquired and the collaborative learning environment that MOOCs facilitate.

Digital self-efficacy

One of the key predictors of entrepreneurial intention, particularly in the digital sphere, is digital self-efficacy (DSE). Bandura's (1977) self-efficacy theory defines self-efficacy as an individual's belief in their capacity to execute behaviors necessary to achieve specific goals. Digital self-efficacy refers to an individual's confidence in their ability to use digital tools and technologies effectively. High levels of DSE are strongly correlated with an increased likelihood of pursuing digital entrepreneurship. Studies have shown that individuals with greater confidence in their digital skills are more likely to identify entrepreneurial opportunities in the digital economy and act on them (Hsu, Shinnar, Powell, 2014).

Empirical evidence underscores the importance of DSE in shaping digital entrepreneurial intentions. For instance, a study by Zhao et al. (2022) found that digital self-efficacy was a significant predictor of entrepreneurial intentions among university students enrolled in digital entrepreneurship programs. The study concluded that students with higher levels of DSE exhibited stronger intentions to pursue digital ventures due to their belief in their ability to navigate the digital landscape effectively.

Additionally, the relationship between DSE and entrepreneurial intention is moderated by factors such as access to digital resources and exposure to digital education (Chen, Chen, 2021). Individuals with both high DSE and greater exposure to digital educational platforms have been found to have significantly stronger entrepreneurial intentions, highlighting the interaction between personal confidence and external support in the digital domain.

Conceptual framework

The body of empirical research examining digital entrepreneurial intention is steadily growing. Recent studies have consistently identified digital skills and digital self-efficacy as critical factors influencing digital entrepreneurial intention. For example, a longitudinal study by Obschonka et al. (2020) found that digital self-efficacy significantly predicted digital entrepreneurial intention over a three-year period among aspiring entrepreneurs in Europe. The study also highlighted the role of online communities and digital platforms in reinforcing entrepreneurial intentions through network effects. Moreover, an analysis by Pihie and Bagheri (2022) found that individuals exposed to digital entrepreneurship education were more likely to express entrepreneurial intentions compared to those who received traditional entrepreneurship training.

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The researchers concluded that the combination of digital skills development and the practical application of entrepreneurial theories through digital platforms was key to fostering higher entrepreneurial intention. Another study by Qureshi et al. (2023) explored the impact of social media exposure on digital entrepreneurial intention. The study found that individuals who actively participated in entrepreneurial communities on platforms like LinkedIn and Instagram exhibited higher digital entrepreneurial intentions due to increased access to resources, mentorship, and peer influence. This indicates that digital self-efficacy and digital education, coupled with social engagement, create an ecosystem conducive to entrepreneurial growth in the digital economy (Radović-Marković et. al., 2021).

Digital entrepreneurial intention is influenced by a combination of individual factors such as digital self-efficacy and educational exposure, as well as external factors like access to digital platforms and networks. As the digital economy continues to expand, fostering digital entrepreneurial intention through targeted education and skill-building initiatives will be crucial for nurturing the next generation of digital entrepreneurs. Empirical findings strongly support the role of digital education and digital self-efficacy in shaping entrepreneurial intentions, suggesting that investments in these areas will have long-lasting impacts on the success of digital entrepreneurship. Grounded in both empirical evidence and theoretical foundations, the authors propose the following relationships among the key variables (Figure 1).

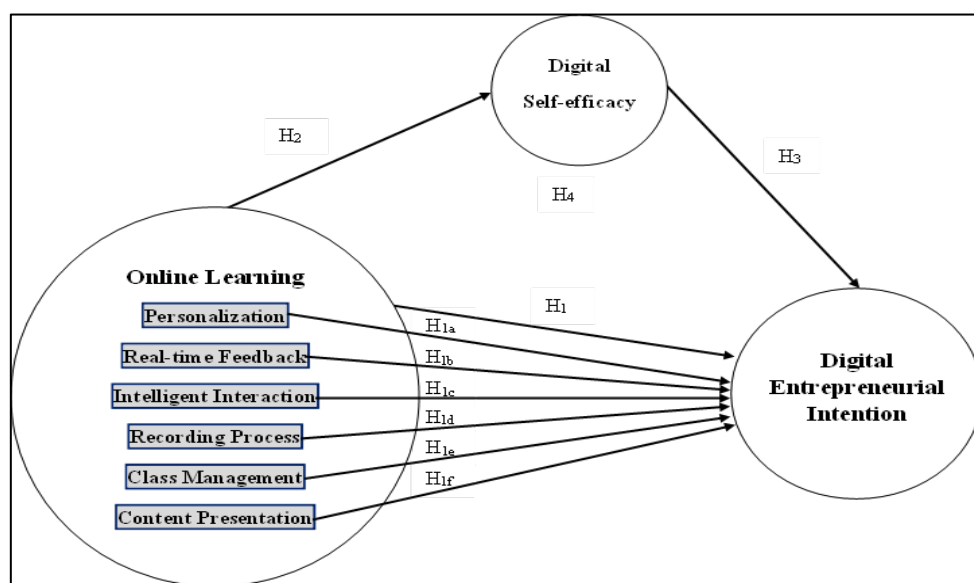


Figure 1. Conceptual Framework
Authors based on Wang et al. (2021)

METHODOLOGY

This investigation is epistemological in nature, as it explores the assumed relationships within the context of their current theoretical framework. Additionally, the study adopts a positivist research philosophy, asserting that the variables demonstrate objective behavior, which is supported by the fractal data derived from the research environment. The study further posits that these variables' behavior has long-term implications for the study subjects. A deductive research method was employed, grounded in the established theoretical foundation. The study utilizes quantitative data, which is analyzed



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objectively, leading to the adoption of a quantitative methodology and a survey-based approach. As a cross-sectional study, data collection occurred only once.

The study examined the extent to which digital entrepreneurial intention is influenced by online learning and individuals' digital self-efficacy. Online learning, and digital self-efficacy were treated as input variables, with digital self-efficacy functioning as a mediator (Figure 1). Digital entrepreneurial intention was the outcome variable. Facets of online learning (personalization, real-time feedback, intelligent interaction, recording process, class management, and content presentation) were evaluated for their individual influence towards digital entrepreneurial intentions (Wang et al., 2021). The variables were measured using instruments with established reliability and validity, which were further verified through the assessment of the measurement model in Partial Least Squares - Structural Equation Modeling (PLS-SEM). The survey tool comprised three instruments aimed at evaluating different aspects of online learning (24 items), digital self-efficacy (25 items), and digital entrepreneurial intention (6 items). Responses were captured using 5-point and 7-point Likert scales (Appendix 1: Table A1), where 1 represented "strongly disagree," and 5 or 7 represented "strongly agree."

Data collection was conducted through an online questionnaire distributed to undergraduates enrolled in the Moodle-based Learning Management System (LMS) at Faculty of Business Studies & Finance (FBSF), Wayamba University of Sri Lanka. Moodle was chosen as the platform for testing the study model because it serves as the university's primary e-learning system, designed to support a range of teaching and learning materials and activities. It facilitates various interactive features, including forums, wikis, quizzes, surveys, chats, and peer-to-peer activities, serving the majority of departments and students. Additionally, Moodle is widely adopted across the education sector, particularly in higher education.

The sample consists of internal undergraduates from the FBSF for the 2021/2022 academic year. All participants completed their first two academic years (six semesters) entirely through online learning, utilizing a 100% virtual format via the university's LMS. Additionally, they completed several ICT-related course units and two course units in entrepreneurship. The sampling frame included the index numbers of all internal undergraduates at FBSF for the 2021/2022 academic year. The sample size was determined using the "10-times rule method," a widely used guideline for deciding sample size in PLS-SEM (Hair et al., 2011, Peng, Lai, 2012, Shoab, Radović Marković, 2017). According to this method, the sample size should be at least 10 times the maximum number of paths pointing to any latent variable in the model (Goodhue et al., 2012).

Based on this, the minimum required sample size was 90 (9 x 10). To account for potential low response rates, five times the minimum required sample size was drawn using a lottery method. As a result, 450 questionnaires were distributed, with a response rate of 70%, yielding 312 valid responses. Table 1 outlines the respondents' demographic characteristics. The data was analyzed using PLS-SEM with the SmartPLS (version 4) statistical software in which a Hierarchical Component Model (HCM) was developed. PLS-SEM was employed as it provides robust explanations of the relationships among latent variables, generating fewer contradictory results than regression analysis and allowing for the analysis of multiple independent and dependent variables. Additionally, PLS-SEM improves the parsimony of the analysis (Hair et al., 2014, Ringle et al., 2012).

Table 3. Profiles of the Respondents

	Attribute	n	%
Gender	Male	103	33
	Female	209	67
Age (in years)	20	128	41
	21	184	59
Specialization	Accountancy	71	23



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	Business Management	207	66
	Banking & Finance	26	08
	Insurance & Risk Management	08	03

$n = 312$

The sample was predominantly female (67%) and composed mainly of business management undergraduates (66%). All participants fell within the 20-21 age range.

RESULTS

This section opens with descriptive statistics, followed by the correlation analysis results. It then presents the key findings from the data analysis, which include the evaluation of the measurement and structural models using PLS-SEM, along with a summary of the hypothesis testing.

Table 4. Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation	Skewness	Kurtosis
	(Response scale – 5-point and 7-point Likert scales)			
Personalization	4.92	1.09	-0.69	0.15
Real-Time Feedback	5.02	1.01	-0.81	0.77
Intelligent Interaction	5.01	1.27	-0.53	-0.10
Recording Process	4.69	1.32	-0.48	0.16
Class Management	4.16	0.79	-1.31	2.34
Content Presentation	4.05	0.59	-0.46	0.53
Online Learning	4.64	0.71	-0.73	0.34
Information and Data Literacy	4.98	1.01	-0.34	-0.08
Communication and Collaboration	5.58	0.93	-0.75	0.56
Digital Content Creation	4.07	0.55	-0.44	0.24
Safety	3.88	0.55	-0.29	0.22
Problem Solving	3.67	0.68	-0.57	0.57
Digital Self-Efficacy	4.44	0.57	-0.52	0.69
Behavioral Intention	5.41	1.09	-0.58	0.23
Entrepreneurial Capacity	5.36	1.16	-0.64	-0.06
Digital Entrepreneurial Intention	5.38	1.08	-0.64	0.25

$n = 312$

The descriptive statistics for the variables indicate generally positive perceptions, with most means exceeding 4, suggesting that respondents rated the variables favorably (Table 2). The standard deviations are relatively low, implying that responses were fairly consistent across participants. Skewness values are negative for all variables, indicating a left-skewed distribution, where respondents tended to rate the variables higher, clustering toward the positive end of the scale. The kurtosis values are mostly near zero, implying that the distributions are close to normal, with some variables exhibiting slight

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peakedness (leptokurtic tendencies). Overall, the data reflect favorable responses across the variables with minimal variation, demonstrating a generally uniform and positive sentiment.

Table 5. Correlation between Study Variables

	Digital Entrepreneurial Intention	Personalization	Real Time Feedback	Intelligent Interaction	Recording Process	Class Management	Content Presentation	Online Learning
Personalization	.713**							
Real Time Feedback	.680**	.759**						
Intelligent Interaction	.738**	.662**	.633**					
Recording Process	.535**	.434**	.367**	.690**				
Class Management	.147**	.041	.071	.103	.122*			
Content Presentation	.288**	.187**	.199**	.204**	.148**	.241**		
Online Learning	.798**	.803**	.776**	.880**	.758**	.315**	.385**	
Digital Self Efficacy	.582**	.436**	.483**	.425**	.317**	.299**	.552**	.584**

$n = 312$

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

The Pearson correlation coefficients reveal significant positive relationships (Schober et al., 2018) between several variables and Digital Entrepreneurial Intention (Table 3). Notably, Online Learning demonstrates the strongest correlation ($r = .798$), indicating a strong link between the quality of online learning experiences and the intention to pursue digital entrepreneurship. Intelligent Interaction ($r = .738$) and Personalization ($r = .713$) also show strong correlations, suggesting that customized and interactive digital environments contribute significantly to fostering entrepreneurial intentions. Real-Time Feedback ($r = .680$) and Digital Self-Efficacy ($r = .582$) display moderate correlations, highlighting the importance of immediate feedback and confidence in digital skills. Other variables, such as the Recording Process ($r = .535$) and Content Presentation ($r = .288$), have weaker but still significant relationships, while Class Management exhibits the weakest correlation ($r = .147$). Overall, these results suggest that elements related to user engagement, personalization, and confidence in digital learning are key contributors to strengthening digital entrepreneurial intention.

Sarstedt et al. (2014) recommended a two-phase approach to data analysis in PLS-SEM: first, assessing the measurement model (outer model) and second, assessing the structural model (inner model). The measurement model involves evaluating reliability and validity using Composite Reliability (CR), Cronbach Alpha (CA) for internal consistency, Average Variance Extracted (AVE) for convergent validity, and Discriminant Validity for unidimensionality (Hair et al., 2013). In this study, both Low-Order Constructs (LOC) and High-Order Constructs (HOC) are assessed for reliability and validity through Confirmatory Factor Analysis (CFA) in PLS-SEM.

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The low-order measurement model (Figure 2) included items with loadings meeting the reference criterion ($FL > 0.708$; Hair et al., 2013), with only items that met this threshold retained (Appendix 2: Table A2). The CR and Cronbach's alpha values for all latent variables exceeded the minimum thresholds ($CR > 0.70$, $CA > 0.70$), confirming internal consistency. The AVE values (> 0.50) ensured convergent validity, while discriminant validity was confirmed using Fornell and Larcker's (1981) criterion (Appendix 2: Table A3).

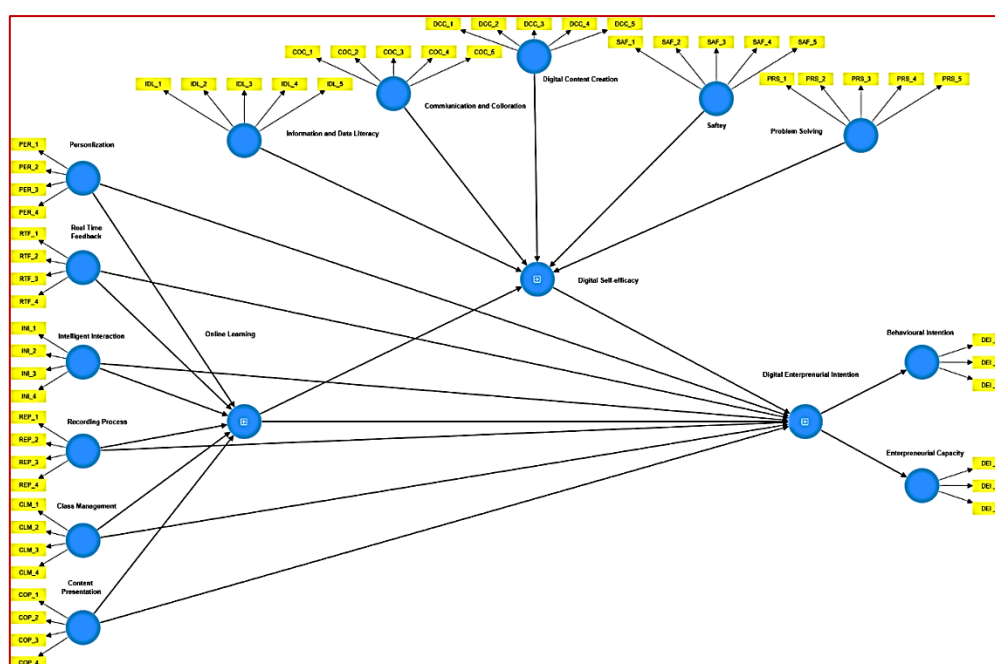


Figure 2. The Measurement model
Authors based on Results of the Data Analysis

The high-order measurement model, also reflective, used the same criteria for reliability and validity. The embedded approach estimated the latent variables, with the low-order model's estimates used as indicators in the high-order model. Table A4 (Appendix 4) and A5 (Appendix 5) confirm that all reliability and validity indices are within acceptable ranges, ensuring the soundness of the model.

Finally, the structural model (Figure 3), containing three HOCs (online learning, digital self-efficacy, and digital entrepreneurial intention), was assessed to test the hypothesized relationships (Sarstedt et al., 2014, Janadari et al., 2016).

The reliability and validity of the structural model were evaluated using convergent validity, collinearity, weights, and significance. Tables A6 (Appendix 6) and A7 (Appendix 7) confirm that the model is largely reliable and valid. Collinearity was assessed through the Variance Inflation Factor (VIF), with all values below 3 (Diamantopoulos, Sigouw, 2006), indicating minimal overlap among indicators (Appendix 6). Convergent validity was confirmed with AVE values above 0.5 (Appendix 4). The path coefficients, along with their p-values and t-statistics (Appendix 7), show that all paths except, Class Management $\rightarrow$ Digital Entrepreneurial Intention, Content Presentation $\rightarrow$ Digital Entrepreneurial Intention, and Recording Process $\rightarrow$ Digital Entrepreneurial Intention significantly influence digital entrepreneurial intention, indicating the independent variable (online learning) is a strong determinant of the dependent variable (digital entrepreneurial intention).

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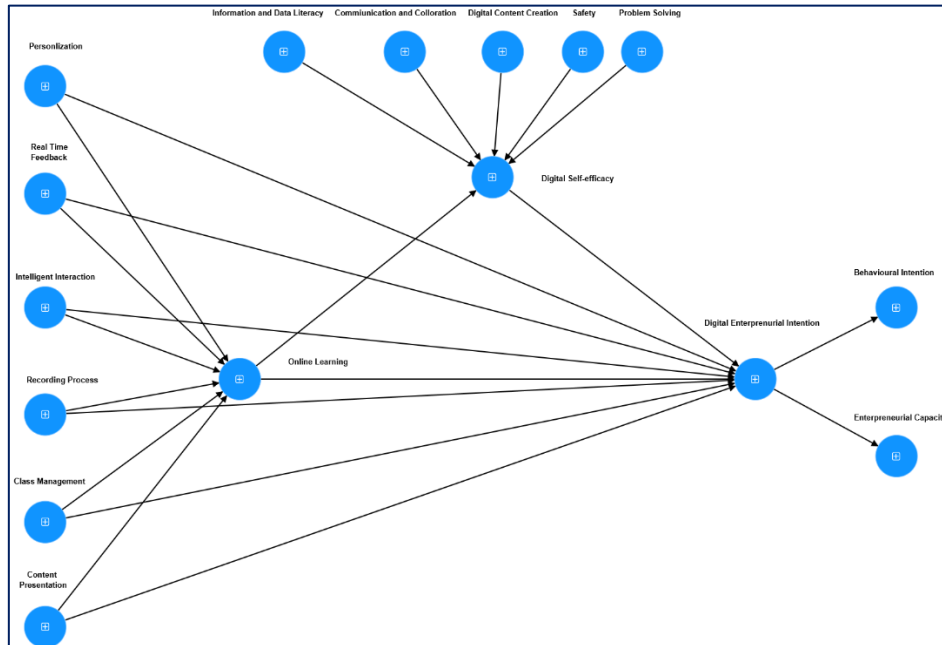


Figure 3. Structural model

Authors based on Results of the Data Analysis.

Additionally, the VIF values for HOCs were within acceptable limits (> 3), confirming no significant collinearity among exogenous variables (Appendix 8). The structural model's coefficient of determination (R^2) is 0.703, indicating that 70.3% of the variance in digital entrepreneurial intention is explained by the model (Cohen, 1988). Effect size (f^2) for independent variables was determined using Hair (2014) and Cohen's guidelines, showing that the variables had varying effects, from small to significant, on digital entrepreneurial intention.

Table 6. The Effect Size of Independent Variables on The Dependent Variable

Variable	Digital Entrepreneurial Intention	Effect size
Online Learning	0.366	Larger
Digital Self-Efficacy	0.382	Larger
Personalization	0.207	Medium
Real-Time Feedback	0.150	Medium
Intelligent Interaction	0.094	Smaller

Authors based on Results of the Data Analysis

The evaluation of f^2 shows that both online learning and digital self-efficacy have larger effect on digital entrepreneurial intention, while personalization, and real-time feedback have medium effects. The mediating effect of digital self-efficacy on the online learning - digital entrepreneurial intention relationship was also found to be larger (Table 4). The structural model's predictive relevance assesses how well it explains the variance in the endogenous construct, typically measured using Q^2 . A Q^2 value greater than 0 indicates that the exogenous construct has predictive relevance for the endogenous construct (Stone, 1974, Geisser, 1974, Hair et al., 2021). The Q^2 value for this model is 0.239.

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The evaluation of the two measurement models (Low and High-Order Models) shows that the authors successfully filtered an appropriate set of indicators to estimate the latent constructs. The structural model evaluation further revealed that, digital self-efficacy, and the online learning significantly influence digital entrepreneurial intention, with mediating effect from digital self-efficacy. As a result, these latent constructs can be modeled to explain the variance in digital entrepreneurial intention with strong predictive ability.

In the path analysis, the model's hypotheses are tested based on the significance and strength of the standardized regression estimates for each individual path (Schumacker, Lomax, 2004). Table 5 presents the results of the hypothesis testing.

Table 7. Summary of Hypotheses Testing

Hypothesis	Results			Decision
	Standard β estimate	p-value		
H ₁ : Online Learning impacts Digital Entrepreneurial Intention	0.232	0.000		Significant
H ₂ : Online Learning impacts Digital Self-efficacy	0.176	0.000		Significant
H ₃ : Digital Self-efficacy impacts Digital Entrepreneurial Intention	0.270	0.000		Significant
H ₄ : Digital Self-efficacy mediates the relationship between Online Learning and Digital Entrepreneurial Intention	H ₁ :	0.232	0.000	Significant (Partial; mediation)
	H ₂ :	0.176	0.000	
	H ₃ :	0.270	0.000	
H _{1a} : Personalization of Online Learning impacts Digital Entrepreneurial Intention	0.268	0.007		Significant
H _{1b} : Real-time Feedback of Online Learning impacts Digital Entrepreneurial Intention	0.145	0.030		Significant
H _{1c} : Intelligent Interaction of Online Learning impacts Digital Entrepreneurial Intention	0.373	0.000		Significant
H _{1d} : Recording Process of Online Learning impacts Digital Entrepreneurial Intention	0.147	0.078		Insignificant
H _{1e} : Class Management of Online Learning impacts Digital Entrepreneurial Intention	0.002	0.949		Insignificant
H _{1f} : Content Presentation of Online Learning impacts Digital Entrepreneurial Intention	0.010	0.794		Insignificant

Authors based on Results of the Data Analysis



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The study supported many hypotheses (H_1-H_4 & $H_{1a} - H_{1c}$), with online learning, digital self-efficacy, personalization, real-time feedback and intelligent interaction, being significant predictors of digital entrepreneurial intention at the 0.05 significance level. These latent constructs are identified as strong positive predictors of digital entrepreneurial intention based on the standard estimates (β). Additionally, the mediating effect of digital self-efficacy (H_4) is significant (Baron, Kenny, 1986, Hair et al., 2021), though partial mediation was observed for its' effect.

DISCUSSION AND CONCLUSION

This study explored the influence of online learning, digital self-efficacy, and various features of online learning environments on digital entrepreneurial intention PLS-SEM. The results offer significant insights into the factors driving digital entrepreneurial intention, with several hypotheses being supported, while others were not. These findings provide a nuanced understanding of the interplay between online learning and entrepreneurial behavior in the digital economy.

The results confirmed that online learning positively impacts digital entrepreneurial intention (H_1) with a significant β estimate of 0.232 and p -value < 0.001 . This finding aligns with prior research that highlights the importance of digital education in fostering entrepreneurial skills (Morris et al., 2021; Hadi, Abdallah, 2023). Online learning environments provide individuals with the flexibility to acquire entrepreneurial knowledge and develop the competencies needed to thrive in digital markets, which in turn strengthens their intention to pursue entrepreneurial ventures (Qazi et al., 2022).

Furthermore, online learning was also found to have a significant effect on digital self-efficacy (H_2 ; $\beta = 0.176$, $p < 0.001$), consistent with previous studies indicating that digital learning platforms can enhance learners' confidence in using digital tools and technologies (Bandura, 2018, Chang et al., 2023). Digital self-efficacy, in turn, showed a significant positive impact on digital entrepreneurial intention (H_3 ; $\beta = 0.270$, $p < 0.001$). This result is consistent with recent findings by Urban (2022), which emphasize the critical role of self-efficacy in predicting entrepreneurial intention, particularly in digital contexts where individuals must navigate uncertainties and complex technological environments.

The mediation analysis (H_4) confirmed that digital self-efficacy partially mediates the relationship between online learning and digital entrepreneurial intention. This partial mediation ($p < 0.001$) indicates that while online learning directly fosters digital entrepreneurial intention, its impact is amplified when learners develop greater self-efficacy through their educational experiences. Similar findings have been reported by scholars such as Farooq et al. (2022), who identified digital self-efficacy as a crucial mediator in the relationship between learning experiences and entrepreneurial outcomes.

Several specific features of online learning were tested for their impact on digital entrepreneurial intention, yielding mixed results. Personalization of online learning had a significant effect (H_{1a} ; $\beta = 0.268$, $p = 0.007$), suggesting that learners benefit from customized content that caters to their specific needs, ultimately enhancing their entrepreneurial mindset. This finding is supported by recent literature indicating that personalized learning experiences promote deeper engagement and stronger entrepreneurial outcomes (Alomari et al., 2023).

Real-time feedback (H_{1b} ; $\beta = 0.145$, $p = 0.030$) and intelligent interaction (H_{1c} ; $\beta = 0.373$, $p < 0.001$) were also found to significantly influence digital entrepreneurial intention. These results align with previous studies that highlight the importance of immediate feedback and interactive learning environments in fostering entrepreneurial learning (Mueller, Shepherd, 2016, Liu et al., 2022). Real-time feedback helps learners adjust their strategies and enhance their decision-making skills, while



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intelligent interaction through adaptive learning technologies enhances critical thinking and problem-solving abilities, both essential for entrepreneurial success in digital domains.

Contrary to expectations, the hypotheses related to the impact of the recording process (H_{1d} ; $\beta = 0.147$, $p = 0.078$), class management (H_{1e} ; $\beta = 0.002$, $p = 0.949$), and content presentation (H_{1f} ; $\beta = 0.010$, $p = 0.794$) on digital entrepreneurial intention were not supported. These findings suggest that while these aspects of online learning may contribute to the overall learning experience, they may not directly influence entrepreneurial intentions. The insignificant impact of class management and content presentation may reflect the notion that these elements are more focused on structuring the educational environment rather than fostering the intrinsic motivation and confidence necessary for entrepreneurship (Dabbagh, Kitsantas, 2020).

The recording process was close to significance but did not meet the threshold ($p = 0.078$). This could indicate that while recorded lectures offer flexibility and convenience, they might lack the dynamic engagement and real-time interactions that are crucial for fostering entrepreneurial intention. Studies by Richardson et al. (2021) also suggest that passive learning methods, such as recorded content, might be less effective in promoting the active learning required for entrepreneurial mindset development.

This study highlights the significant role of online learning and digital self-efficacy in shaping digital entrepreneurial intention, with specific online learning features such as personalization and intelligent interaction driving these outcomes. However, elements like class management and content presentation had no significant impact. Despite its contributions, the study has limitations, including a focus on self-reported data, which may introduce bias, and a cross-sectional design, limiting causality. Future research should explore longitudinal approaches and diverse contexts to provide deeper insights into how digital learning environments influence entrepreneurial behaviors over time.

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