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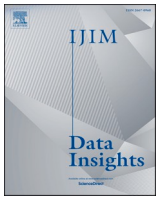

Fintech literacy and digital entrepreneurial intention: Mediator and Moderator Effect

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ABSTRACT

Our paper contributes to the nascent field of digital entrepreneurship by proposing a model linking students' Fintech literacy to digital entrepreneurial intention based on the application of the Theory of Planned Behaviour. Structural equation modelling (SEM) with bootstrapping method was used to examine the relationships between variables from a sample of 466 Vietnamese university students. The findings reveal that personal attitude towards digital entrepreneurship and perceived behavioural control are the key determinants of digital entrepreneurial intention. Three Fintech literacy dimensions (namely blockchain, crowdfunding, and AI literacy) are found to directly affect digital entrepreneurial intention. Furthermore, the mediating roles of attitude towards digital entrepreneurship and perceived behavioural control are empirically supported. Family business background can increase the impacts of Fintech literacy on Digital entrepreneurial intention. This study provides empirical evidence in the field of digital entrepreneurship in a developing transition economy. Research suggests recommendations to promote digital entrepreneurship intention among students.

1. Introduction

Digital technologies are transforming the nature and scope of entrepreneurial activity (Von Briel et al., 2021). Technological advancements and digital technology adoption are viewed as a key driver of entrepreneurship, and the development of digital technologies has altered the entrepreneurial process and has already led to a boom in digital entrepreneurship (Nambisan, 2017). Digital entrepreneurship is the result of a newly launched business that is carried out using technology. The emergence of digital entrepreneurial activity is critical to economic development of a country since it expands employment opportunities, advances technology and promotes economic growth (Wang et al., 2022). Although growing rapidly, academic research in digital entrepreneurship faces some challenges. Despite a large number of published academic literature on traditional entrepreneurship, there are relatively few studies on digital entrepreneurship (Mohammed et al., 2023, An, 2014, Paul et al., 2023). The limited emergent research clearly showed that the digital entrepreneurship topic is still in infancy and requires further investigation and understanding (Paul et al., 2023).

Unlike previous studies on traditional entrepreneurship, the research topic on digital business is relatively novel and lacks extensive empirical studies (Von Briel et al., 2021, Paul et al., 2023). Several studies shed light on the factors that affect university students' digital entrepreneurial intention. Recent studies on digital business start-ups have identified various factors that influence the intention to set up digital businesses from different perspectives. In general, there are two main groups of determinants: endogenous factors and exogenous factors. Regarding the influence of endogenous factors, scholars found that socio-psychological factors such as self-perceived creativity, social media, digital personal competence and entrepreneurial passion play important roles in enhancing intrinsic motivation, fostering e-entrepreneurial spirit, and generating entrepreneurial determination (Nambisan, 2017, Mohammed et al., 2023). On the other hand, regarding exogenous factors, studies have highlighted the importance of educational support, university support and government support (Von Briel et al., 2021, Nambisan, 2017, Mohammed et al., 2023). Although there is a growing strand of literature investigating individual entrepreneurial intention in the context of higher education, however, research is sharply skewed toward the examination of digital entrepreneurship. This gap leads scholars to call for more studies on digital entrepreneurship from multiple perspectives (Von Briel et al., 2021, Wang et al., 2022, Paul et al., 2023).

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New technological concepts and business models also provide a basis for innovative solutions in finance. Financial Technology - Fintech innovation has made it easier for underbanked and unbanked populations to obtain financial services. Fintech is utilized to help companies, business owners better manage their financial operations and processes (Autio et al., 2018, Festa et al., 2022). It helps to create novel opportunities for providing products and services through the application of novel technologies. Fintech changes the entrepreneurial ecosystems (Hendrikse et al., 2018), transform the provision of financial services, drive the creation of novel products, business models, applications and processes (Wang et al., 2022). As a result, Fintech has become one of the key players in the emergence of new growing digital entrepreneurship sectors (Festa et al., 2022, Leong et al., 2017).

One specific feature of entrepreneurship in the digitization world is the requirement of technical capacity with significant human capital compared to other types of more traditional new ventures such as restaurants or shops (Wright et al., 2007). As the business environment is digitized, rising importance is placed on digitally talented individuals, their skills evolve with the momentum matching that of technological innovation. Many theoretical and empirical studies in entrepreneurship have demonstrated the importance of high technical knowledge and skills in enabling entrepreneurs to successfully adapt to changes in technology and take advantage of opportunities (Chan et al., 2017, Elia et al., 2020, Stolper and Walter, 2017). Some recent studies believe that financial literacy can motivate innovative activities and risk-taking in business, which in turn affect digital entrepreneurship mindsets (Stolper and Walter, 2017, Hasan et al., 2023). While other studies in the field of digital entrepreneurship literature examine the role of digital literacy (Chan et al., 2017, Zaheer et al., 2019), financial skills Fintech access (Hasan et al., 2023) in Fintech adoption and usage in new business (Stolper and Walter, 2017, Nathan et al., 2022), little is known about the connection between Fintech literacy and digital entrepreneurship.

Moreover, there is a significant gap in financial literacy level between developing and developed countries (Phung, 2023). Fintechs can also be established more easily in developed economies, where market regulations and technical infrastructure already exist. This infrastructure, plus affordable technology, is a key to create sustainable and unique financial innovations (Puschmann, 2017). Fintech formation takes place more often in economies in which access to loans is more difficult (Hasan et al., 2023). Following this argumentation, Vietnam is a middle-income country, a developing economy with lower tech infrastructure and culture (Nathan et al., 2022). It is critical to investigate how Fintech literacy influences the entrepreneurial intention of potential young entrepreneurs (qualified students) in Vietnam through the theory of planned behaviour (TPB) (Ajzen, 1991).

Since entrepreneurial intention is the best prediction for of entrepreneurial career decision, scholars have applied TPB to examine the impact of exogenous factors on entrepreneurial intention The current research adopts TPB as a comprehensive model that investigate the direct as well as indirect impact of Fintech literacy on digital entrepreneurship intentions through its two key cognitive determinants namely personal attitude and perceived behavioural control. Second, we integrate the three most recent Fintech innovation: crowdfunding, blockchain and AI as potential determinants of intentions to digital entrepreneurship. Third, this research provides insight into the vital role of family business background as a moderating influence of Fintech literacy on the intention to become a digital entrepreneur, the model has been ignored by scholars in the field of digital entrepreneurship before.

This research aims to fill existing gaps in digital entrepreneurial intention by investigating three questions:

- How does Fintech literacy influence students' digital entrepreneurial intention?
- Does perceived behaviour control and attitudes towards digital entrepreneurship mediate the relationship between Fintech literacy and students' entrepreneurial intention?
- Is the relationship between Fintech literacy and digital entrepreneurial intention stronger for individual with family business background?

This research will serve to provide a concrete basis for entrepreneurial education efforts, for policy solutions from the government, and help to assess the core competencies of entrepreneurs in digital context complexities.

The paper is structured as follows. Section 2 in this paper continues with a literature review. The model and hypotheses are presented in Section 3, methodology is discussed in Section 4. The results from the structural equation model and discussion are presented in Section 5.

2. Literature review

2.1. Digital entrepreneurship

Entrepreneurship can be considered the pursuit of the opportunity for an individual to start a new business venture (Liñán and Chen, 2009). It is a dynamic process that requires the generation and implementation of new ideas and solutions.

Digital technology development has brought about great changes in all aspects of life, including the economic development of each country. Technological innovations are redesigning current traditional business models, operational activities and management strategies (Wang et al., 2022). The outstanding developments of these science and technology tools are considered as the proxy to reduce average costs, optimize time, improve productivity, quality and develop innovative ideas so that business entities continue to innovate and expand (Festa et al., 2022). At the same time, the widespread use of digital technologies is creating new needs (new products, new services and especially informational goods) and requiring new firms and a new type of entrepreneur.

The intersection of entrepreneurship and digital technology is creating a new generation of entrepreneurs who apply digital technology and the Internet to optimize the necessary requirements for a new business project (Elia et al., 2020). Several scholars have proposed definitions of digital entrepreneurship (Paul et al., 2023). Zaheer *et al.* (2019) (Zaheer et al., 2019) defines digital entrepreneurship to be the process of creating a digital start-up as a new business or within an established firm. Mohammed *et al.* (2022) (Mohammed et al., 2023) regards digital entrepreneurship as the use of digital media and other information and communication technology to accelerate changes in the competitive landscape. According to Elia *et al.* (2020) (Elia et al., 2020), digital entrepreneurship is creating new value by applying digital technology to the manufacturing process of a product, service or business management. Digital business activity is based on the expenditure of information technology to market, distribute or transform products, which takes place on the Internet. Digital entrepreneurship can very well fall under a wide range of different categories. These subcategories (such as business operations systems; management processes control; product - services sales and marketing; supply chain, storage and distribution systems), along with any new subcategories that may emerge as a result of the improvement and innovation of technology, are all subject to change resulting from the progression of technology (Alferaih, 2022, Al-Mamary and Alraja, 2022). Digital entrepreneurship is recognized as the lifeblood of the modern economy especially in the context of the emergence and remarkable development of the modern technological era, the focus on and emphasis on the entrepreneurial spirit in the digital business field is the key to stimulating national economic growth (Al Halbusi et al., 2023).

2.2. Fintech literacy

Puschmann (2017) (Puschmann, 2017) describes financial technology (Fintech) as the use of new technology that seeks to improve and automate the delivery and use of financial services. At its core, fintech is

the use of software, applications, and digital platforms to deliver financial services to consumers and businesses through digital devices. It is utilized to help business owners, companies, and consumers better manage their financial operations, processes, and lives (Nathan et al., 2022). It is composed of specialized software and algorithms that are used on smartphones or computers. Fintech is increasingly integrated and widely applied in all areas of social life, in different industries, segments and sectors such as retail banking, education, fundraising and investment management. According to Festa et al., (2022) Von Briel *et al.* (2021) and Hua *et al.*, (2019) (Nambisan, 2017, Wang et al., 2022, Vaig et al., 2023, Hua et al., 2019) the key fintech applications are artificial intelligence (AI), blockchain and crowdfunding.

Recently, the literature has generally regarded fintech as the crucial influencing factor motivating entrepreneurship. FinTech includes digital innovations and business model innovations. This innovation contributes to breaking down existing technical barriers, facilitating access to financial services, and networking with existing companies, thereby increasing the opening of new opportunities and promoting the entrepreneurial spirit (Gomber et al., 2017). FinTech has superior features such as saving time, reducing costs, increasing customer access and effectively managing risks (Hua et al., 2019). In other words, Fintech promises to bring prospective growth to traditional financial solutions, enhance the development of new capabilities and transform culture (Nathan et al., 2022). Moreover, Fintech provides innovation in financial solutions which is often used for start-ups supported by information technology (Puschmann, 2017). Fintech integrates advanced technological changes into financial sector innovation, contributing to the formation of new, institutionally oriented financial tools, technologies and markets (Ferrari, 2022). Research has shown that since access to bank finance is a key factor in the propensity for launching and maintaining an online business (Nguyen, 2020), the development of Fintech is a factor promoting innovation for the financial services industry, thereby contributing to promoting start-up (Gomber et al., 2017).

However, the rapid development of digital technology in recent years has made the use of digital devices, technologies and applications in fintech become increasingly intelligent. Digital technology has fast and significant changes, with some of the previous ideas having become quickly somewhat outdated (Chan et al., 2017). A rising importance is placed on individuals who are fintech talented, who have their knowledge and skills evolve with the momentum matching that of technological innovation in financial activities (Elia et al., 2020, Hasan et al., 2023). Fintech Literacy or Fintech knowledge is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, to enable constructive social action; and to reflect upon this process (Hasan et al., 2023). As the business environment and ecosystem are digitized, Fintech Literacy has become more crucial for entrepreneurs who want to take advantage of Fintech. The benefits of Fintech innovation and application are only effective when entrepreneurs can use internet devices well and have the essential ability to operate computers and mobile phones (Hasan et al., 2023, Morkunas et al., 2019)

Individuals, who can develop a high level of financial literacy, can obtain essential skills to make sound financial and investments decisions, increase their financial freedom, increase their confidence and autonomy, improve their standard of living, and stimulate the motivation and enthusiasm of setting up new ventures (Gomber et al., 2017). Financial literacy also helps to prepare individuals with market knowledge, finance sources, entrepreneurial financial skills, financial knowledge, and entrepreneurial intent (Stolper and Walter, 2017). Besides that, digital literacy of innovations and technology has also contributed to promoting the establishment of startup projects, creating lasting and valuable impact and helping companies achieve their goals for sustainable competitiveness (Elia et al., 2020, Al Halbusi et al., 2023).

Although the role of entrepreneurs' knowledge and skills play in the entrepreneurial mindset and actions are widely understood, the effect of fintech literacy in driving digital entrepreneurial intention is not fully explored in the literature (Paul et al., 2023, Chan et al., 2017, Elia et al., 2020, Zaheer et al., 2019). Previous studies have not really clarified the direct relationship between fintech literacy - the digital technology knowledge in the process of accessing and operating Fintech digital tools and digital platforms to the intention to start a digital business. Also, the current revolution of Fintech technology including artificial intelligence (AI), electronic ledgers (blockchain), and crowdfunding has enormously impacted the e-economy all over the world (Von Briel et al., 2021, Nambisan, 2017). Past efforts to understand the digital knowledge impact on entrepreneurial behaviours have become distant from the evolution of the digital entrepreneurial ecosystem in this digital age, presenting the need to comprehend our understanding of the field (Von Briel et al., 2021, Al-Mamary and Alraja, 2022).

3. Hypotheses development

3.1. TPB and digital entrepreneurial intention

We draw on the Theory of Planned Behaviour (TPB) to analyse students' digital entrepreneurial intentions. Our model is an extension of the model developed by Ajzen (1991) (Fig. 1). Digital entrepreneurial intention is a level of cognitive awareness that leads to the establishment of a new digital business (Mohammed et al., 2023). Entrepreneurial intention is recognised as the most reliable and important predictor of an entrepreneur's planned action (Liñán and Chen, 2009).

In the TPB theoretical concept of intention formation, there are three main intervening variables that determine behavioural intention namely attitudes towards the manifestation of behaviour, perceived behavioural control and social or normative factor. However, scholars argue that subjective norms have an inconsistent influence on entrepreneurial intentions (Doanh and Bernat, 2019). Thus, subjective norms will not be included in our model. Therefore, the research proposes the following hypotheses:

Hypothesis 1a (H1a). *Perceived behavioural control has a positive effect on digital entrepreneurial intention.*

Hypothesis 1b (H1b). *Attitude towards starting a digital business has a positive effect on digital entrepreneurial intention.*

3.2. Fintech literacy and digital entrepreneurial intention

Recently, the literature has generally noted that finance is still the most important factor influencing entrepreneurship success (Hendrikse et al., 2018). Fintech integrates advanced technological changes has provided innovation in financial solutions contributing to the formation of new venture (Ferrari, 2022). The development of Fintech is a factor promoting innovation in the financial services industry, thereby contributing to promoting start-up intentions. Based on the previous literature review, the following hypotheses have been formulated. They aim at investigating the impact of FinTech literacy (in the form of crowdfunding, artificial intelligence and blockchain) as potential influencers of digital entrepreneurial intention.

3.3. Blockchain literacy

Blockchain is a public, secure and transparent open system distributed ledger (Festa et al., 2022). Blockchain technology is a platform for designing financial services to bridge many gaps in today's virtual market system (Wang et al., 2022).

In the current digital era, Blockchain is considered as an effective tool in digital finance activities because of the fruitful benefits brought by this technology (Vaig et al., 2023). Blockchain is revolutionizing entrepreneurship by democratizing access to financial services and

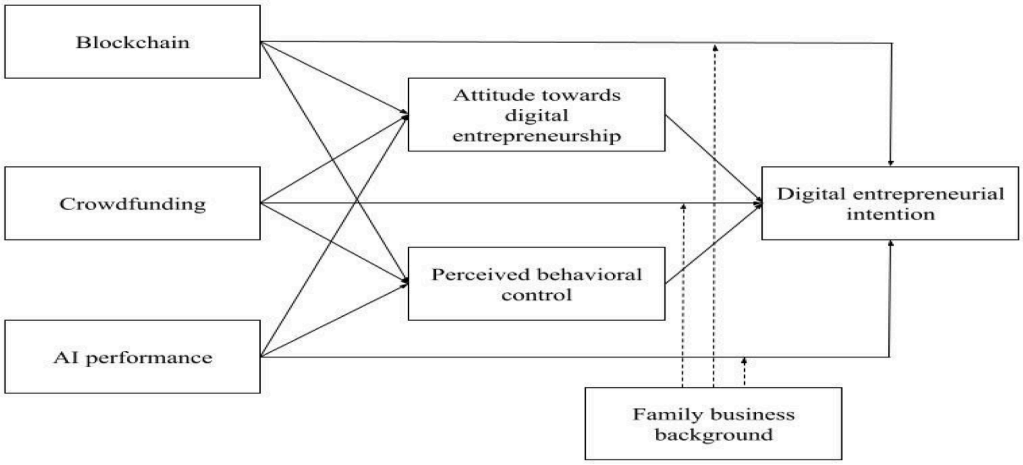

Fig. 1. Research model

resources. With the use of blockchains, all stakeholders can access and grasp the production stages and business products (Hasan et al., 2023). Thus, the necessary resources such as finance – capital, marketing to carry out business activities are fully provided only through the Blockchain platform. The use of emerging technologies such as Blockchain can contribute to increasing the efficiency of business operations, companies can exploit and innovate to develop products, services, and business processes that both capitalize on these new capabilities and help create new opportunities and breakthroughs (Festa et al., 2022, Hua et al., 2019). The unexpected success of electronic money with its reliability, high safety, simplicity and flexible application in the field of transactions. The decentralized nature of blockchain offers entrepreneurs the capability to create trust-based networks and systems that do not rely on traditional financial intermediaries such as banks or regulatory bodies (Morkunas et al., 2019). This paradigm shift is fundamentally changing the way entrepreneurs approach risk management, fundraising, value creation and the whole business models. Supported through blockchain technology, Fintech has stimulated hundreds of start-ups to build services such as mobile payments and international money transfers, especially without going through any intermediaries (Leong et al., 2017), thereby making an important contribution to world financial regulation and distribution. Moreover, Blockchain can make relationships more transparent and trustworthy for entrepreneurs and potential investors (Wang et al., 2022, Morkunas et al., 2019). Understanding all the above benefits of Blockchain thereby promotes the spirit of individuals to participate in starting a business (Vaig et al., 2023).

Blockchain literacy can increase the perception of the entrepreneur's ability to control the process of starting a digital business. Blockchain awareness enables entrepreneurs to better interact with technology, make rational decisions to support opportunistic digital ventures, which greatly contributes to promoting the trust and positive attitude of entrepreneurs towards the business start-up process in the complex technology landscape (Elia et al., 2020). The better the knowledge about the performance of the blockchain, the better the vitality of the entrepreneurial ecosystem (Festa et al., 2022). Therefore, the proposed hypothesis is as follows:

Hypothesis 2. *Blockchain literacy has a positive effect on (a) perceived behavioural control, (b) attitude towards digital entrepreneurship and (c) digital entrepreneurial intention.*

3.4. Crowdfunding literacy

Crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business venture (Gomber et al., 2017). Entrepreneurship involves the process of creating something new, entrepreneurs spend time, effort and accept financial, psychological and social risks. One of the most difficult problems that early-stage enterprises face is finding stable sources of investment capital (An, 2014, Morkunas et al., 2019). In other words, besides the necessary resources, one of the most important factors for success is finance (An, 2014, Hendrikse et al., 2018).

Crowdfunding is considered an open call, which creates an intermediary environment between individuals or start-up businesses looking for funding for their projects. Crowdfunding provides a financial tool aiming at improving the financial access of start-ups and small and medium enterprises (Belleflamme et al., 2014). Meanwhile, because of its optimal uses, Crowdfunding plays an important role in "financial innovation", contributing to eliminating difficulties and barriers in the process of finding flexible capital sources. Therefore, crowdfunding platform via the Internet is an important key to solving financial problems in the start-up phase. Accordingly, crowdfunding is considered a potential platform with a great impact on digital business start-ups, especially in emerging economies (Phung, 2023). With the feature of operating via the Internet, crowdfunding has created an intermediary environment between individuals or start-ups looking for funding for their projects. Therefore, this form of capital financing is considered as a valuable alternative source of funding for entrepreneurs who are looking for external financing with a huge amount of seed capital mobilized, provides a good opportunity for digital business entrepreneurs to have more resources to start a business and promote entrepreneurship (Belleflamme et al., 2014).

Hypothesis 3. *Crowdfunding literacy has a positive effect on (a) perceived behavioural control, (b) attitude towards digital entrepreneurship and (c) digital entrepreneurial intention.*

3.5. Artificial intelligence literacy

Artificial intelligence (AI) has been proven to effectively support businesses in the long run by being able to transform almost every corner of financial services, interacting with customers, robo-advisory, market research and even fraud detection. Artificial intelligence (AI) has been proven to be an effective fintech support businesses in the long run (Rajab and Sharma, 2018). Since the application of AI will contribute to promoting the innovation of enterprises, enabling automation, and thereby improving competitiveness in the market through strategic business initiatives, then AI is considered as a motivating tool for the formation of entrepreneurial intentions (Wang et al., 2022). AI deployed either selectively or ubiquitously has the potential to impact both the likelihood of an individual deciding to start a venture and the type of venture that they go on to found (Chalmers et al., 2021). AI brings

fundamental changes to the entrepreneurship mindset by impacting the perceived attitude of individuals toward digital opportunities, decision-making processes, and services delivered. Because AI remains a highly technical domain, only nascent entrepreneurs who are capable of performing these technical roles will successfully pursue an AI opportunity (Hasan et al., 2023). AI literacy will become a "partner" to change entrepreneurs' cognition to start a digital business (Dabbous and Boustani, 2023). Therefore, the following hypothesis is proposed:

Hypothesis 4. *AI literacy has a positive effect on (a) perceived behavioural control, (b) attitude towards digital entrepreneurship and (c) digital entrepreneurial intention.*

In the TPB model, personal attitudes and perceived behaviour control mediate the relationships between contextual factors and entrepreneurial intention. We extend this by also considering the impacts of fintech on the entrepreneurial intention with personal attitudes and perceived behaviour control as mediators.

H5. *Attitude towards digital entrepreneurship mediates the relation of (a) AI, (b) Crowdfunding, (c) Blockchain literacy with digital entrepreneurial intention.*

H6. *Perceived behavioural control mediates the relation of (a) AI, (b) Crowdfunding, (c) Blockchain literacy with digital entrepreneurial intention.*

3.6. The moderating role of family business background

Entrepreneurial family background refers to those people whose parent is involved in business or entrepreneurship activities. Bae et al., (2014) (Bae et al., 2014) reports that individuals' family business background could provide them with the chance to engage in business activities and acquire knowledge and skills about entrepreneurship, markets, risks and customers' services. Bae et al., (2014) (Bae et al., 2014) demonstrated that family business background can moderate the effect of the entrepreneurship education and entrepreneurial intentions. We suppose that individuals' family business background can increase the impacts of Fintech literacy on Digital entrepreneurial intention because of the following reasons. First, individuals with family business background can be influenced by their parents' role model when choosing entrepreneurial career choices. Second, family business background gives individuals a chance to access the critical resources and social networks, a favourable frame for learning skills, and acquire human capital. Third, growing up in a business context creates positive beliefs about an entrepreneurial career (Arafet., 2020). Therefore, they could interpret the opportunities offered by Fintech awareness more critically than those from a nonentrepreneurial family. Thus, we propose the following hypothesis:

H7. *Family business background moderates the paths from (a) Blockchain literacy, (b) crowdfunding literacy and (c) AI literacy to digital entrepreneurial intention. The influences of Blockchain, Crowdfunding, and AI literacy on Digital entrepreneurial intention with family business background become stronger than for the students without family business background.*

4. Methodology

4.1. Data collection

Data were collected using a quota convenience sampling technique with control of participants' study major and gender to ensure the representative of the sample. The survey participants are students in Ha Noi, which is the area with the most concentrated universities in Northern Vietnam. Students can be seen as a potential incubator for entrepreneurs, final year students are expected to be at a stage close to making career decisions, undergraduate student sample is widely used in entrepreneurship research (Nambisan, 2017, Paul et al., 2023), and a similar sample was used in this study. The questionnaire was sent to students online through email invitations to fill out the survey on Google Forms and offline through handwritten paper forms. Since this is a cross-sectional study, the procedural remedies suggested by Podsakoff et al. (2003) were adopted to avoid the magnitude of common method bias (Podsakoff et al., 2003). All participants were informed about the research purpose and the survey was completely voluntary.

A total of 389 hard copy of questionnaires were delivered, and 387 questionnaires were collected, which resulted in a 99% response rate. An online google form of questionnaires was sent to 361 email address, received 115 responses, response rate of 31.8%. However, 36 questionnaires were eliminated due to owing the missing data. Finally, the research sample consisted of 466 survey responses, which were included in the final data analysis. The final sample includes 64.2% female participants. 49.8% of students are majoring in economics - business administration and 50.2% are studying engineering or technical fields. 82.2% report that they have never engaged in entrepreneurship activities and 81.8% have never enrolled in entrepreneurship courses.

4.2. Measures

The scales used in this study were adapted from previous studies. The original survey was created in English. A back-translation approach was adopted to translate questionnaire into Vietnamese and ensure that matching was achieved. First, the scales were translated into Vietnamese from the English version and some terms were adjusted to fit the digital entrepreneurship research context. They were then translated back into English with the help of a native English translator to ensure consistency in meaning. Then pre-test with a qualitative survey has been conducted for the accuracy of meaning and translation. All scales were measured using a 5-point Likert scale, ranging from 1 as "strongly disagree" to 5 as "strongly agree."

The Blockchain (BLC) scale consists of 5 observed variables inherited from Festa *et al.* (2022) (Festa et al., 2022). The Crowdfunding (CRF) scale is applied with adjustments from Festa *et al.* (2022) (Festa et al., 2022). The AI performance (AIP) scale has 3 observed variables applied, with adjustments from Dabbous and Boustani (2023) (Dabbous and Boustani, 2023). Perceived behavioural control (PBC), attitude toward entrepreneurship (ATT), and digital entrepreneurial intention (DEI) scales are adopted from Liñan and Chen (2009) (Liñán and Chen, 2009).

4.3. Data analysis

The data were processed and analysed using SPSS 22 and AMOS 24 software. First, Harman's single-factor test was conducted to examine the common method bias. Cronbach's alpha coefficient, and Exploratory Factor Analysis (EFA) were computed to evaluate the scale's reliability and validity. Then, Confirmatory Factor Analysis (CFA) was employed to assess the convergent and discriminant validity of the measurement scales. Finally, the measurement model and hypotheses are evaluated using Structural Equation Modelling (SEM).

5. Results and Discussions

5.1. Common Method Biases Tests

Statistical methods following the recommendations of Podsakoff et al. (2003) (Podsakoff et al., 2003) were employed to control for common method bias. First, all the observed variables were subjected to Harman's one-factor test. The results revealed the extraction of six factors, which explained 64.061% of the total variance. Notably, the first factor accounted for 36.366%, which is less than 50% (considered good) according to Podsakoff et al. (2003) (Podsakoff et al., 2003). To test the severity of common method bias, CFA of competing models, hypothesized five-factor and one-factor models were conducted. The results indicated that the proposed model significantly fit the data better than the model including all items loading on one latent construct. Therefore,

the analysis results from the dataset were less prone to being confounded by common method bias.

5.2. Measures assessment

The results of the EFA, as shown in Table 1, indicate that the 31 items of the 6 variables load in six factors. KMO = 0.94, sig.< 0.001. In addition, all the items are loaded into the original factors and have loadings above 0.5. The Skewness–Kurtosis values were categorized as promising values, and the normality of the constructs was thus affirmed (Hair et al., 2014).

Cronbach's Alpha coefficient, which measures internal consistency, should be higher than 0.6, and the corrected item-total correlations should be greater than 0.3 for a scale to be considered reliable (Hair et al., 2014). The results in Table 2 demonstrate that all variables have Cronbach's Alpha coefficients greater than 0.7, and corrected item-total correlations greater than 0.5. Therefore, the scales were deemed statistically significant and exhibited high reliability.

Confirmatory Factor Analysis (CFA) was conducted to assess both the convergent and discriminant validity of the measurement scales as well as to examine the association between the items and latent variables. The measurement model demonstrated a satisfactory fit, as evidenced by the following indices: CMIN/df = 1.885 < 3, GFI = 0.898 > 0.8, CFI = 0.948 > 0.9, TLI = 0.943 > 0.9, RMSEA = 0.044 < 0.06 and PCLOSE = 0.988 > 0.90 (Hair et al., 2014). In addition, both the Average Variance Extracted (AVE) and Composite Reliability (CR) achieved acceptable levels (Table 3). Specifically, the CR values surpassed the recommended threshold of 0.6 for all constructs and the AVE values for the variables exceeded 0.5, indicating satisfactory convergent validity. Furthermore, the square roots of the AVE for all constructs were greater than the inter-construct correlations, affirming the reliability and discriminant validity of all measurement scales in accordance with the criteria highlighted by Hair *et al.* (2010) (Hair et al., 2014).

5.3. Hypothesis testing

The results of the Structural Equation Modelling (SEM) test, as shown in Fig. 2. The measurement model demonstrated a good fit: CMIN/df = 1.926 < 3, GFI = 0.895 > 0.8, CFI = 0.946 > 0.9, TLI = 0.940 > 0.9, RMSEA = 0.045 < 0.06 and PCLOSE = 0.973 > 0.9 (Hair et al., 2014). Even though the values for GFI did not exceed 0.9, it still met the requirement suggested by Baumgartner and Homburg (1995), the value is acceptable if above 0.8 (Baumgartner and Homburg, 1996). The findings indicate that all hypotheses are supported, with p-values ≤ 0.05 for each hypothesis.

This study applies the modified TPB model proposed by Ajzen (1991) (Doanh and Bernat, 2019) to investigate how attitudes and perceived behavioural control affect the intent to start a digital business of Vietnamese university students. The research findings show that attitude toward digital entrepreneurship behaviour (β = 0.198, p <0.005), and perceived behavioural control affect digital entrepreneurship intentions of Vietnamese students (β = 0.350; p < 0.001). Hypotheses H1a, H1b are supported. In general, behavioural control attitudes and perceptions toward entrepreneurship are two important determinants of digital entrepreneurship intention. The positive relationships between variables and entrepreneurial intention in the theory of planned behaviour (TPB) are consistent with previous studies (Phung, 2023, Al-Mamary and Alraja, 2022, Al Halbusi et al., 2023, Doanh and Bernat, 2019,

Table 1
Descriptive characteristic and factor loadings of items

Pattern Matrix[a]										
	Component									
	1	2	3	4	5	6	Mean	Std. Deviation	Skewness	Kurtosis
BLC1				.790			3.76	.901	-.583	.213
BLC2				.808			3.71	.902	-.515	.098
BLC3				.841			3.56	.886	-.453	.156
BLC4				.724			3.59	.951	-.447	-.070
BLC5				.707			3.61	.938	-.649	.404
CRF1			.676				3.14	.886	-.038	-.338
CRF2			.754				3.70	.857	-.567	.444
CRF3			.822				3.59	.873	-.372	.167
CRF4			.792				3.62	.878	-.357	.064
CRF5			.756				3.57	.865	-.303	-.017
CRF6			.709				3.41	.919	-.211	-.130
AIP1						.828	3.77	.929	-.657	.209
AIP2						.760	3.65	.924	-.443	.017
AIP3						.808	3.73	.997	-.596	-.106
PBC1	.782						3.10	1.011	-.032	-.465
PBC2	.773						3.04	1.001	.094	-.601
PBC3	.848						3.12	.978	-.072	-.453
PBC4	.781						3.06	1.052	-.020	-.641
PBC5	.821						3.14	1.087	-.157	-.653
PBC6	.716						3.20	.994	-.088	-.450
ATT1					.697		3.38	.923	.018	-.370
ATT2					.777		3.45	.884	-.143	-.243
ATT3					.778		3.60	.892	-.345	-.124
ATT4					.800		3.47	.916	-.206	-.248
ATT5					.747		3.32	.901	.117	-.395
DEI1		.696					3.22	1.041	.012	-.541
DEI2		.813					3.36	.971	-.156	-.323
DEI3		.730					3.45	.869	-.163	-.165
DEI4		.828					3.37	.883	-.159	-.093
DEI5		.685					3.36	.923	-.011	-.330
DEI6		.817					3.28	.973	-.030	-.308

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

(Source: authors' research)

Table 2
Cronbach's Alpha

Variables		Cronbach's Alpha	Corrected Item-Total Correlation
Blockchain (BLC)	BLC1	0.861	0.696
	BCL2		0.705
	BCL3		0.687
	BCL4		0.647
	BCL5		0.659
Crowdfunding (CRF)	CRF1	0.858	0.580
	CRF2		0.654
	CRF3		0.682
	CRF4		0.613
	CRF5		0.681
	CRF6		0.677
AI performance (AIP)	AIP1	0.797	0.663
	AIP2		0.641
	AIP3		0.621
Perceived behavioural control (PBC)	PBC1	0.888	0.868
	PBC2		0.865
	PBC3		0.865
	PBC4		0.865
	PBC5		0.864
	PBC6		0.872
Attitude toward entrepreneurship (ATT)	ATT1	0.833	0.582
	ATT2		0.645
	ATT3		0.584
	ATT4		0.718
	ATT5		0.632
Digital entrepreneurial intention (DEI)	DEI1	0.881	0.641
	DEI2		0.717
	DEI3		0.665
	DEI4		0.724
	DEI5		0.712
	DEI6		0.696

(Source: authors' research)

Dabbous and Boustani, 2023). Most of them in the context of traditional entrepreneurial intentions, this study has expanded the literature in exploring the correlation among these variables of the TPB model in the digital business field.

In this study, we aim to find out the direct and indirect impact of fintech literacy including blockchain, crowdfunding and AI on students' digital entrepreneurship intentions. Research results show that blockchain, crowdfunding and AI literacy impact perceived behavioural control ($\beta = 0.272^{***}$, $\beta = 0.189^{***}$, $\beta = 0.181^{*}$, respectively). Hypotheses H2a, H3a, H4a are accepted (Table 4). These findings support the suggestions from previous entrepreneurship research that, as a general-purpose technology, blockchain and AI-based entrepreneurial opportunities have been identified across many industries and there is a significant venture capital flowing towards AI start-ups (Paul et al., 2023, Chalmers et al., 2021). Financial accessibility is one of the key elements giving potential entrepreneurs the confidence to involve in entrepreneurship activities (An, 2014, Beltrame et al., 2023). This result reconfirms Wright *et al.* (2007) (Wright et al., 2007) opinion about the importance of knowledge and experience in enabling potential entrepreneurs' capacity to successfully implement technology-based new ventures, shortage of skills is a major barrier to opportunity recognition and exploitation of technology-based entrepreneurs.

The results also show that blockchain, crowdfunding and AI impact attitudes toward entrepreneurship ($\beta = 0.297^{***}$, $\beta = 0.311^{***}$, $\beta = 0.137^{*}$, respectively). Hypotheses H2b, H3b, H4b are accepted. These results are in line with Chalmers *et al.* (2021) (Chalmers et al., 2021) who insist that AI is believed as one of the most fashionable and dynamic areas of start-up activity. These novel technological affordances will affect potential entrepreneurs' creativity and cognitive processes toward a preferred attitude of technology-based new venture (Mohammed et al., 2023, Elia et al., 2020).

Fintech literacy directly impacts digital entrepreneurship intentions. Research results show that blockchain literacy positively impacts digital entrepreneurship intentions ($\beta = 0.154^{*}$). Hypothesis H2c is accepted. This result is consistent with the research of Festa et al. (2022), Morkunas *et al.* (2019) (Festa et al., 2022, Morkunas et al., 2019). This shows that blockchain and AI technology is a promising technology in the finance sector with bitcoin payments, electronic records, digital identification, reduced costs and secure reliability higher (Morkunas et al., 2019, Podsakoff et al., 2003). Those fintech help to formulate digital tools or procedures through which entrepreneurs could handle business uncertainties by leveraging the potential of digital technologies thus increasing the potential of digital entrepreneurship intentions (Paul et al., 2023). Crowdfunding literacy has a positive impact on digital entrepreneurship intentions ($\beta = 0.185^{**}$), which allows accepting hypothesis H3c. This supports the argument that crowdfunding is an emerging technology platform for capital mobilisation that helps small businesses or entrepreneurs have more opportunities to access finance and this is expected to impact the business sector in general (Festa et al., 2022). The positive impact of AI literacy on digital entrepreneurship intention is confirmed ($\beta = 0.127^{*}$), hypothesis H4c is accepted. This is in line with Dabbous and Boustani (2023) (Dabbous and Boustani, 2023) who supposed that AI is a solution that promotes more convenient business operations and is at the forefront of technology fields that claim to have an impact on entrepreneurship intentions. This result is consistent with research by Chalmers *et al.* (2021) (Chalmers et al., 2021), demonstrating that individuals, who have AI awareness and skills, might use an AI-blockchain hybrid platform to manage financial accounting to promote digital entrepreneurship. As new digital business firms are frequently established on the foundation of innovative business models that distinguish them from industry rivalries, fintech literacy develops potential digital entrepreneurial intention. The results confirm the study of Festa et al. (2022) (Festa et al., 2022), which shows that fintech tools, as a new concept, require more attention from the entrepreneurial community, especially in emerging economies where unemployment is high and access to bank finance is difficult.

Bootstrapping was used to explore the mediating relationships. The results in Table 5 show that the Fintech variables (Blockchain, Crowdfunding literacy) have both direct and indirect relationships with DEI through ATT. This finding expresses a physiological connection and more specifically confirms the TPB model, as well as highlights the importance of the environment and externalities on entrepreneurial

Table 3
Composite reliability, average variance extracted and Pearson correlation.

	CR	AVE	Inter-construct correlations					
			PBC	CRF	DEI	ATT	BLC	AIP
PBC	0.889	0.571	0.756					
CRF	0.859	0.504	0.481***	0.710				
DEI	0.883	0.558	0.728***	0.625***	0.747			
ATT	0.834	0.504	0.519***	0.552***	0.617***	0.710		
BLC	0.862	0.555	0.464***	0.641***	0.638***	0.575***	0.745	
AIP	0.799	0.570	0.405***	0.472***	0.561***	0.477***	0.674***	0.755

Notes(s): *** $p < 0.001$, AVE: Average Variance Extracted, CR: Composite Reliability

(Source: authors' research)

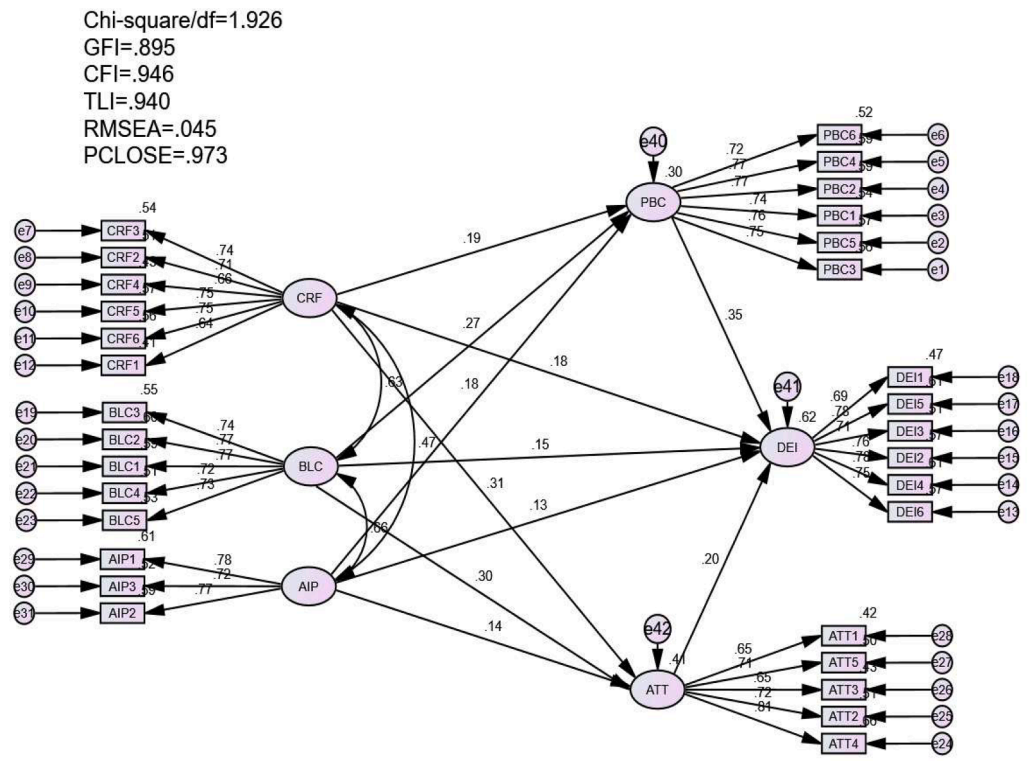

Fig. 2. Structural Equation Modelling (Standardized estimates)

Table 4
Hypothesis test results (standardized)

Hypothesis		Estimate	P-value	Description
H1a	DEI <— PBC	0.350	***	Supported
H1b	DEI <— ATT	0.198	***	Supported
H2a	PBC <– BLC	0.272	***	Supported
H2b	ATT <– BLC	0.297	***	Supported
H2c	DEI <— BLC	0.154	*	Supported
H3a	PBC <– CRF	0.189	**	Supported
H3b	ATT <– CRF	0.311	***	Supported
H3c	DEI <– CRF	0.185	**	Supported
H4a	PBC <— AIP	0.181	*	Supported
H4b	ATT <— AIP	0.137	*	Supported
H4c	DEI <— AIP	0.127	*	Supported

Note(s): *** p < 0.001, ** p < 0.010, * p < 0.050

(Source: authors' research)

Table 5
Indirect effects results (standardized)

Indirect Path	Lower	Upper	Estimate
CRF –> PBC –> DEI	0.081	0.231	0.140**
CRF –> ATT –> DEI	0.020	0.101	0.048*
BLC –> PBC –> DEI	-0.009	0.170	0.079*
BLC –> ATT –> DEI	0.013	0.106	0.043*
AIP –> PBC –> DEI	0.005	0.137	0.068
AIP –> ATT –> DEI	0.003	0.052	0.023

Note(s): ** p < 0.010, * p < 0.050

(Source: authors' research)

cognition and intention in the business creation process (Al Halbusi et al., 2023, Doanh and Bernat, 2019, Mbaidin et al., 2023). When people are fintech skilful, they engage in a cognitive process to be confidence about their capacity to handle digital entrepreneurship action, and change to a favourable attitude toward digital entrepreneurship, and that cognitive awareness motivate entrepreneurial intention, as the TPB has proposed.

However, the research found some interaction effect – the mediation role of PBC and ATT in the relations between AI literacy and DEI are not significant, probably highlighting the complex impact of AI literacy on digital entrepreneurial intentions (Festa et al., 2022, Hua et al., 2019). The unexpected finding may be resulted from the challenges of AI for business. While AI technologies is expected to generate a new wave of innovation, create great entrepreneurial potential, AI is an enabler but also an obstacle for entrepreneurs (Chalmers et al., 2021). The economic benefits of AI are not yet significant compared to its huge investment. AI are still in the early stages of development in low tech country like Vietnam (Nathan et al., 2022). Entrepreneurs, although understand the potential of the technology, may not be confidence for realistic results and willing to set up digital venture.

We applied a multi-group analysis to test the moderator in AMOS software. Data was split into two separate files with or without family business background. We obtained the estimates of the unconstrained model and constrained model for both data sets. Table 6 presents the output for the constrained model and unconstrained model. The significance of the difference between the two groups are estimated by the $\chi 2$ statistics of the unconstrained and the constraint model. The chi-square statistic demonstrated that the constrained (Chi-square = 588.255, df = 331) and unconstrained models (Chi-square = 574.905, df = 328) were significantly different (ΔChi-square = 13.350, Δdf = 3, p <

Table 6
The moderating effect of family business background - standardized estimates.

Hypothesis				Standardized Coefficients	
				With (n =340)	Without (n = 126)
H1	DEI	<–	AIP	.356	.308***
	DEI	<–	BLC	.053	.295***
	DEI	<–	CRF	.267*	.306***

***, **, 5%, 10% significance levels, respectively.
(Source: authors' survey)

0.001). The variation of $\chi 2$ while a change of the degree of freedom is 1, is larger than 3.841 ($p< 0.01$), therefore report the significance of moderation at the 5% significance level. The unconstrained model has good fitness indices ($\chi 2$ /DF=1.753< 3, CFI = 0.946, TLI = 0.937 > 0.9, RMSEA = 0.040 < 0.05). The impact of Fintech literacy (Blockchain, AI) on digital entrepreneurship intentions were significant in the group with family business background (standardized $\beta = 0.295$***, standardized $\beta = 0.308$***, respectively) and was not significant in the group without family business background ($p > 0.1$). Moreover, the influence of CRF on DEI exhibited a larger path effect in students with family business background (standardized $\beta = 0.306$ ***) than students without family business background ($\beta = 0.267$*) (Fig. 3). Thus, all the hypotheses of moderating effects H5a, H5b, and H5c are supported.

These differences caused by the moderator support by the arguments of Bae et al. (2014), Arafet. (2020) (Bae et al., 2014, Arafet., 2020) that family entrepreneurial background establishes a favourable framework for learning, social networking, entrepreneurship careers orientation. This awareness of Fintech integrates with skills and desirability acquired from family, thus creating positive beliefs about an entrepreneurial career. This study provides empirical evidence supporting previous studies which have shown that the higher individuals' family business tradition, the more conducive to their entrepreneurial confidence (Bae et al., 2014). Individuals with Fintech literacy and rich social capital, which is resulted from family experiences and foundations, can improve individuals' alertness and activation in identifying digital entrepreneurial opportunities and strengthen their intention to set up new business. This difference is an important indicator for policy makers as well as helping us understand the complexities of the entrepreneurship process.

6. Research Implications, Limitations and Future Research Direction

6.1. Theoretical Contributions and Practical Implications

Previous studies only discussed the impact of fintech on young entrepreneurial intentions or the intentions to use fintech to develop small businesses. The results of this study increase our understanding about digital entrepreneurship - the emergence field of research. The findings demonstrate the role of digital awareness (blockchain, AI, and crowdfunding literacy) in development of digital entrepreneurial intentions. FinTech literacy acts as a powerful contributor to perceived behavioural control and attitude toward digital entrepreneurship, and these perceived cognitions act as a platform encouraging digital entrepreneurial intentions. Although perceived behavioural control seems to generate no significant mediating stimulus on the relationship between AI and entrepreneurial intention. Further research could be developed to understand this complex bidirectional relationship.

Digital technology development offers new opportunities to people continuously, students can take this technological infrastructure to become new digital entrepreneurs only if they are well-trained and have high-tech knowledge and skills. The educational institutions should focus and invest more in digital skills development courses that inspire students and give them self-efficacy to become digital entrepreneurs.

Another interesting point from the research is that students with family business background acquire more benefit from digital literacy than students without family business background do. This knowledge is important for university to design their programs in a more targeted and effective manner. Educators can motivate digital entrepreneurs not only by increasing digital technology knowledge but also business - entrepreneurship experience. Teaching high technology should be incorporated with entrepreneurship education.

6.2. Limitation and future research direction

This research contains several limitations that may serve as guidance for future research frameworks. First, the differences between different types of AI, blockchains, Crowdfunding are not explored. Cryptocurrencies have become a transactional currency in light of the growing development of these digital assets. As a result, future research will likely need to take into consideration these different platforms to provide more comprehensive results and understandings. Second, since the research has a cross-sectional design, the findings of this work should be interpreted and be validated and replicated by a qualitative study using a sample of students from various disciplines and contexts. Future researchers should think of using both quantitative and qualitative research tools to analyse data that will enrich the body of literature. Longitudinal data will also allow investigation of the long-term impact of fintech literacy on entrepreneurial action and success. People in different regions or countries tend to prefer different blockchain properties. Future research should take into account the differences between the sample groups in various societies or nations.

7. Conclusion

Digital entrepreneurship plays an important role in an innovative and diverse economy with many different sectors. This research has provided valuable insights into the relationship between fintech literacy dimensions and digital entrepreneurial intentions in the platform of the TPB model. While the previous literature stressed the impact of digital environmental factors, they have not considered the financial digital literacy of potential entrepreneurs. By showing that fintech literacy is important for developing digital entrepreneurial intentions, this study will expand knowledge and understand the benefits that blockchain, AI, and crowdfunding bring to the development of digital businesses.

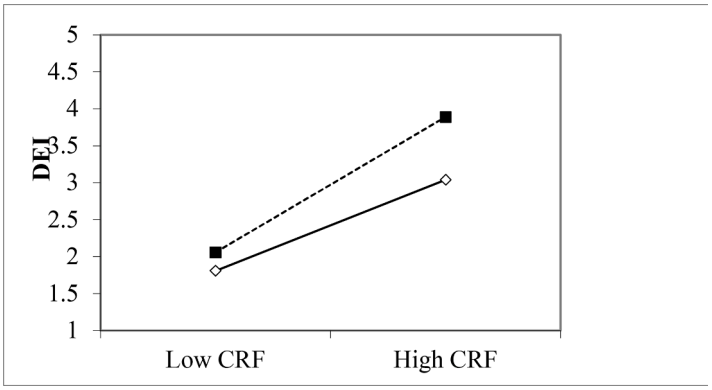

Fig. 3. Family business background moderates the impact of CRF on DEI

Author Biography

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Ethics Statement

Since this was a non-experimental, voluntary survey, there were no ethical issues associated with this survey. The responses were fully anonymous and the topic of the survey was far from sensitive.

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CRediT authorship contribution statement

Thuy Thu Nguyen: Writing – review & editing, Project administration, Methodology, Conceptualization. **Trang Thu Dao:** Writing – original draft, Investigation, Data curation. **Tram Bao Tran:** Writing – original draft. **Huong Thi Thu Nguyen:** Writing – original draft, Investigation. **Linh Thi Ngoc Le:** Writing – original draft, Investigation. **Nguyen Thi Thao Pham:** Writing – review & editing, Project administration, Methodology, Conceptualization.

Declaration of competing interest

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

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jjimei.2024.100222.

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