

**The Relationship between Entrepreneurship Education and
Digital Entrepreneurship Intentions among Engineering
Graduates of Pakistan**



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**A thesis submitted in partial fulfillment of the requirements for the degree of
MS Innovation and Entrepreneurship (MS I&E)
NUST Business School (NBS)**

National University of Sciences & Technology (NUST)

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By

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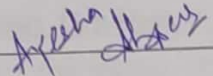
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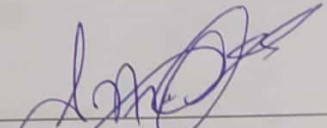
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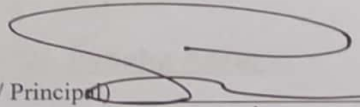
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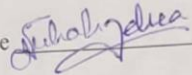
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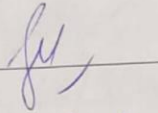
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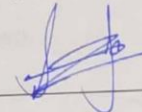
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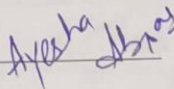
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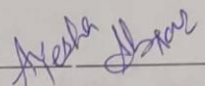
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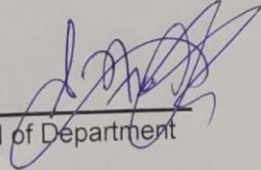
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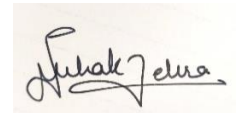
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The Relationship between Entrepreneurship Education and Digital Entrepreneurship Intentions among Engineering Graduates of Pakistan

Abstract

Digital entrepreneurship is a dynamic and sustainable business model that aims to promote the growth of the digital entrepreneurial ecosystem. This research examines the relationship between entrepreneurship education and digital entrepreneurship intentions. Firstly, the role of digital entrepreneurial self-efficacy as a mediator is examined, shedding light on the mechanisms through which entrepreneurship education influences digital entrepreneurship intentions. Digital literacy is introduced as a moderator to assess the boundary conditions under which this relationship may vary. This study contributes to the existing literature by advancing our understanding of the dynamics surrounding digital entrepreneurship intentions, particularly in the context of entrepreneurship education. The study follows quantitative approach with target audience of 375 engineering graduates of 2022 and 2023 from top ranking engineering universities in Pakistan. The results show that there is a significant positive relationship between entrepreneurship education and digital entrepreneurship intentions. It is further confirmed that digital entrepreneurial self-efficacy mediates the relationship between these two variables in a positive manner, and digital literacy moderates the relationship between them such that if digital literacy is high, then the relationship between entrepreneurial education and digital entrepreneurial intentions will be strengthened. This research thus advances the existing literature by unraveling the intricate dynamics of digital entrepreneurship intentions within the framework of entrepreneurship education, contributing valuable insights for educators, policymakers, and practitioners in the field.

Keywords: Entrepreneurship Education, Digital Entrepreneurship Intentions, Digital Entrepreneurial Self-Efficacy

Chapter 1

Introduction

Entrepreneurship is defined by the pursuit of innovation, risk taking and the creation of value. It holds a central position in the dynamics of the modern economies (Scott Shane and S. Venkataraman, 2000). The importance of entrepreneurship is not only limited to the economic growth but it is also included in employment, progress in technology, and social well-being. Entrepreneurship is not just about starting a business, it includes the whole process of taking the idea to the action (Acs, Estrin, Mickiewicz, & Lá, 2018). Over the course of time, the landscape within entrepreneurship has changed and there is emergence of digital technologies which takes the entrepreneurship from its traditional means towards Digital Entrepreneurship (DE). This has caused new activities within the entrepreneurial ecosystem giving rise to a new field called DE (Sahut et al., 2019). DE helps the entrepreneurs to use the digital technologies in variety of different ways including creating, offering, and capturing value in the most innovative ways. DE has become one of the most important factor in fostering growth in the economic development during the digital age (Zaheer, Breyer, & Dumay, 2019).

Entrepreneurial intentions are an important construct in entrepreneurship. Entrepreneurial intentions are defined as a conscious state of mind to start a new venture with a plan. They are not random rather they are the resultant of several factors of psychological, cultural, environmental origin (Krueger, Reilly, & Carsrud, 2000). The Theory of Planned Behavior is a popular theory for measuring entrepreneurship intentions and as per the theory proposed by Ajzen, an individual's attitude, the subjective norm, and the perceived behavior control makes up the reason for his behavior. The model suggests that planned behavior is a deliberate and reasoned behavior and an individual forms intention based on cognitive and non-cognitive influences imposed upon him (Ajzen, 1991).

As the field is growing, different aspects of DE including factors that affect it are thoroughly

studied. One such factor is intentions which needs to be studied in depth within DE (Al-Mamary & Alraja, 2022). It is crucial to study the intentions of entrepreneurs who embark on the pursuits of the DE. These intentions are considered to be conscious plans of individuals to move to this digital realm. It can include several of different endeavors including the launch of an online business, creating innovative digital products and using the online platforms for the growth of businesses (Farani, Karimi, & Motaghd, 2017). Due to the significance which the intentions hold, it is important to conduct studies which takes into account the factors that develop these intentions (Akhter A. , Islam, Karim, & Latif, 2022).

The complexity behind deciding to become an entrepreneur in the digital world is due to the personal, contextual, and also psychological factors that are majorly involved (Alkhalaileh, Kovács, & Kovács, 2023). The enormous change in entrepreneurship in Pakistan in recent years is mostly about becoming digital entrepreneurs. A shift in the trend has been due to various factors working together to change the traditional way of business and inspire the nation to innovate towards the tech-savvy routes (Glauner, 2018). The tech savvy expertise are not because of the technology to be increasing but the way technology is becoming an essential part of living up in a digital world.

Aslam et al. (2020) observe regarding the adoption of electronic commerce in the least developed countries focusing on the situation of Pakistan. The rise of the internet marketplaces has raised uncountable opportunities for businesses to reach out to people who are interested in showcasing their items or selling anything. As a result, it is considered a significant contribution to the growing digital economy. Experts affirm that online business growth in Pakistan is driven by the development of mobile technologies and modern financing solutions. Rizvi et al. (2018) have conducted a comprehensive study to explore the influences of the mobile financial services to promote financial inclusion. Mobile phone apps and fintech startups have revolutionized the scene which is enabling digital transactions and banking. It has also opened a new window for entrepreneurship to arise in the unexpected quarters. The government of Pakistan has taken several steps to strengthen the growth of this sector by acknowledging its potential for the change. The Government of Pakistan has introduced the Digital Pakistan Policy¹ which is reflecting their strong

¹ https://moib.gov.pk/Downloads/Policy/DIGITAL_PAKISTAN_POLICY%2822-05-2018%29.pdf

inclination to create a conducive environment, stimulate creativity and provide financial incentives to prospective digital businesses. Educational background and developing skills are two pivotal parts of the DE story of Pakistan. Education impacts the entrepreneurial intentions. The researchers further initiate on the importance of educational institutions and training programs in molding the future digital entrepreneurs (Maheshwari , Kha, & Arokiasamy , 2023).

The significance of Entrepreneurship Education (EE) is found in the literature which is one of the key factors (Fayolle, Liñán, & Moriano, 2014). The major aim of EE is to provide an individual with the necessary mindset, skillset, and knowledge which help in launching own entrepreneurial projects in both traditional and digital industries (Rauf, Wijaya, & Tari, 2021). One of the main goals of this education is to enhance an innovation and business-minded society by adopting entrepreneurship mindset and spirit in Pakistan (Maqbool, 2021). Education institutions stakeholders are playing a vital role in it. Moreover, they help in formulating the entrepreneurial ecosystem by giving knowledge, imparting skills, and developing an entrepreneurial mindset within the students (Galvão, Ferreira, & Marques, 2017).

Over the years, the need of EE in a regular academic curriculum is increasing (Duval-couetil, 2013). Here, it is explored that whether or not EE affects the Digital Entrepreneurship Intentions (DEI) of the students who graduate after studying the entrepreneurship courses. There is a need to enrich the curriculum, make the faculty, improve the relationship with businesses and connect the academics with business to pursue the appropriate knowledge to students (Millman, Li, Matlay, & Wong, 2010).

Entrepreneurship training programmes and initiatives can be an added advantage to the conventional classroom-centred educational approach. Pakistan is yet to completely incorporate their entrepreneurship schooling efforts effectively. There are various issues impeding this effort in Pakistan, aside from various breakthroughs (Hameed & Irfan , 2019). Limited funding, poor infrastructure, and a need for better connections with academic stakeholders rest at the core of these gaps. Pakistan's initiative in producing an entrepreneurial mindset highly depends on entrepreneurship instruction. By enlisting specific policies, ties, and hands-on preparation, the country hopes to produce precisely trained entrepreneurs. Eventually, they can uphold better corporate and economy formation, and creativity (Sher et.al, 2019).

There is a need for further research to comprehend the impacts of multiple elements in the relationship between EE and DEI. Several studies have found that both are positively correlated (Dabbous & Boustani, 2023). However, to understand the issue, one needs to investigate the impacts of contextual as well as individual elements in the relationship between EE and DEI. Digital Entrepreneurial Self-Efficacy (DESE) related to DE along with EE and DE intention, is an area yet to be explored (Elnadi & Gheith, 2023). As students come from different educational backgrounds and experiences, their DL varies (Aloulou, Ayadi, Ramadani, & Dana, 2023). A thorough investigation of these moderating and mediating variables can effectively allow us to apprehend the influence of EE on DE intention in a specific environment.

This research seeks to identify if there is any relationship between EE and the generation of intentions among graduates in setting up DE. The focal point is to discover if the various components of EE taught through a course can cause an adequate degree of effect to the intentions for pursuing DE. These two variables are studied in depth along with the factors that affect this relationship. Firstly, the mediating role of DESE is studied which explains how EE can instill intentions among the graduates to take up DE. Secondly, by utilizing Digital Literacy (DL) as the moderator, an understanding is developed about how it changes the level of relationship between EE and DEI.

This study contributes positively to the present state of knowledge by probing the distinctive traits stimulating individuals to take a step towards DE through EE. Thus, by establishing the link between the wider area of EE and the rapidly changing realm of DE, this study provides vital knowledge about the many factors influencing the decision of a job-seeker to venture into a business set-up in the digital domain. By using DL as a moderator and DESE as a mediator, the relationship's underlying mechanisms and limits can be comprehended. The main objective of this research is to highlight the important implications for educational policies and programs that aim to promote entrepreneurship in the digital age.

1.1 Problem Statement

There has come a shift from traditional entrepreneurship to DE. More individuals are now pursuing DE as they are finding more opportunities in this field (Akhter A. , Islam, Karim, & Latif, 2022).

As it grows, it draws more attention for the need to explore the factors that are involved in the growth of DE. The literature has been focused on developing studies which include the exploration of DE as a variable. However, available researches lack the focus given to the study of individuals' intentions to engage in DE (Darmanto S. E., 2022). A vast amount of studies have been conducted that confirm the importance of intentions in the field of entrepreneurship. Hence, it becomes necessary to study the DEI to further make progress in the field (Ahmad, Idrus, & Rijal, 2023). While discussing the intentions necessary to pursue DE, it becomes crucial to study the impact of EE on developing these intentions (Akhter A. , Islam, Karim, & Latif, 2022). EE has been studied by various researchers in various different context including its impact on developing entrepreneurial intentions. However, it is significant to study the impact of EE on DEI (Duvalcouetil, 2013). Studying EE in context of DE can benefit the future stakeholders in developing the intentions of students towards DE. Exploring the function of DESE can provide novel insights into the complicated procedures that transform the influences of this education on the intentions of an individual to be successful in DE (Akhter A. , Islam, Karim, & Latif, 2022). Therefore, defining the equation between EE and Digital entrepreneurial intentions requires research (Alkhalailah, 2021). DESE has been derived from entrepreneurial self-efficacy which has been proved in literature as a significant factor that affects the entrepreneurship intentions. However, DESE being a fairly new variable lacks its introduction in the relationship between the EE and DEI. There are myriad factors which can affect the dynamic relationship between EE and DEI; out of which, it is important to explore the moderating role of DL between this relationship (Primahendra, Purba, Ugut, & Budiono, 2021). The current gap in literature points out the importance of conducting empirical research which measure not only the relationship between EE and DEI but also the underlying mechanisms and contextual factors that affect this relationship. By acknowledging this gap, it will not only help the academic discourse but also provide crucial perspectives to actors interested in developing a vibrant DE ecosystem such as educators, lawmakers, and stakeholders (Alkhalailah M. Y., 2021).

1.2 Research Aim

The study aims to examine the relationship between EE and DEI mediated by DESE and moderated by DL.

1.3 Research Objective

The research aims to

- Determine the nature of the relationship between EE and DEI by analyzing the association between the two variables.
- Investigate the moderating effect of DL on the relationship between EE and DEI
- Examine whether DESE acts as a mediating factor in the interactive relationship between EE and DEI

1.4 Research Questions

The research study intended to answer following questions

Q: What is the relationship between EE and DEI?

Q: What mediating role does DESE play in the relationship of EE and DEI?

Q: What moderating role does the DL play in the relationship of EE and DEI?

1.5 Significance of research

This research is highly significant as it addresses crucial gaps in the literature related to the relationship between EE and DEI. By specifically focusing on the digital domain, the study provides insights into how educational courses influence individuals' intentions to engage in digital entrepreneurial activities. DE is a fairly new concept in entrepreneurship and within DE, the trends have seen to be moving to artificial intelligence, e-commerce, blockchain, digital marketing innovations, and fintech. The introduction of DESE as a mediator enhances our understanding of the psychological mechanisms at play, contributing valuable knowledge for the design of more effective EE programs. Moreover, considering DL as a moderator acknowledges the contextual factors influencing this relationship, making the research highly relevant in the dynamic landscape of DE. DL as a moderator helps figure out how it affects the relationship between EE and DEI. It could help with revising the course material offered to include more digital skills leading to more graduates participating in DE in future. This research is not only academically relevant but also practically impactful, offering insights for educators, policymakers, and entrepreneurs, thereby

contributing to the advancement of both theoretical understanding and practical applications in the field of EE and DE.

1.6 Summary of chapter

The introduction chapter establishes the foundational importance of entrepreneurship in modern economies, emphasizing its role in economic growth, employment generation, technological advancement, and societal well-being. The narrative then shifts to the transformative impact of digital technologies on entrepreneurship, giving rise to DE, a dynamic and influential business model. Within this context, the focus narrows down to understanding DEI and the multifaceted factors influencing them, with EE emerging as a pivotal element. The specificities of Pakistan's DE landscape are highlighted, showcasing the government's initiatives, the role of technology, and the growth of sectors like e-commerce. Subsequently, the introduction delves into the significant role of EE in Pakistan, citing research studies, policies, and challenges. The identified literature gap is presented, underscoring the need for exploring moderating factors in the relationship between EE and DEI. The outlined research aim, objectives, questions, and significance of the study pave the way for an in-depth exploration of this critical intersection between education and DE. The introduction effectively sets the stage for the subsequent chapters, emphasizing the importance of the research in advancing both theoretical understanding and practical applications in the field.

The entire thesis is entailing five chapters. In the introduction chapter major highlights are discussed as background, research aim, research objectives, research gap and significance of this study followed by literature review that draws attention on the theory of planned behaviour (TPB) discussing the theoretical reasoning that helped in devising the hypothesis. The thesis then moves on to the methodology chapter that discusses the methods, sample and analysis followed which lands us in the results chapter that discusses the results, implications, and conclusion.

Chapter 2

2.1 Literature Review

The focus of this chapter is to mention and discuss all the variables that are encompassed in the theoretical model, by starting the chapter with EE, which is independent variable, followed by DEI, which is the dependent variable, with mediating variable which is the DESE and DL as moderating variable. Afterwards, hypothesis development is done with previous and existent research.

2.1.1 Entrepreneurship Intentions

Entrepreneurial intention is a very important aspect of entrepreneurship. It is generally referred to an individual's desire and motivation to engage in entrepreneurship. The modern age of the Internet has opened new doors for the entrepreneurs. Personality traits are one of the factors which attribute leading an individual to entrepreneurship. However, Hassan, Anwar, Saleem, Islam, & Hussain (2021) noted that primarily, the social norms and education are other important factors involved in entrepreneurial intentions. People who have higher entrepreneurial intentions are more prone to leverage these opportunities (Elnadi, & Gheith, 2023).

The idea of intention describes a person's mental state in which they're concentrated on reaching a particular objective (Nabi, & Holden,, 2008). The majority of models of entrepreneurial intention which are being used certainly for behaviour and attitude theories and they concentrate on pre-entrepreneurship events (Ajzen, 1991). If there is a need to predict planned behavior, it usually requires the use of intention analysis mainly which is for uncommon or challenging-to-observe actions. Intention is now being considered as the best indicator which can be used for planned behaviour, including entrepreneurship (Krueger, Reilly, & Alan, 2000). The main idea which was presented for Theory of Planned Behavior is that it is an individual's intention to engage in a particular behavior and that is what motivates the behavior itself (TPB). Because of this, the present study hypothesizes that intention is considered as important in motivating digital entrepreneurial behavior. When there is a stronger intention leading to a higher likelihood of engaging in such behaviour. There are personal traits like self-efficacy, propensity for taking risks, and locus of control which are considered to be positively correlated with entrepreneurial intentions. This is making them individual-level determinants of entrepreneurship intentions

(Liñán & Fayolle , 2015). Intentions can also significantly be shaped by the perceived desirability and viability of entrepreneurship which can be seen influenced by media, role models, and social norms (Krueger, Reilly, & Alan, 2000). Additional to this the environmental elements which are known to cause affect to entrepreneurial intentions include availability of opportunities for entrepreneurship, institutional support, and resource access (Nguyen, 2020). Social networks and support from family, peers and mentors produce social capital and have a favourable influence on intentions.

The formation of entrepreneurial intentions in the individuals is largely influenced by education of them. It has been discovered that involving in EE and training programmes can cause increase in an individual's likelihood of pursuing entrepreneurial career by equipping them with the necessary knowledge they would require, abilities, and self-assurance (Fayolle, Liñán, & Moriano , 2014). The stronger entrepreneurial intentions are most of the times correlated with higher educational attainment, especially in the context of business and field which are related to entrepreneurship. Entrepreneurial intentions can also be influenced from various cultural factors from surroundings. Cultural values that probably influence the spreading and acceptance of entrepreneurship in a society include individualism, a risk-taking propensity, and a tolerance for uncertainty (Shane, S. A. , 2003). Entrepreneurial intentions are generally shaped by cultural norms and beliefs surrounding entrepreneurship which encompass views of success, failure, and social status (Liñán & Fayolle , 2015).

Entrepreneurial intention are seen playing a pivotal role in shaping an individual's willingness and motivation to engage in the entrepreneurial activities (Al-Mamary & Alraj, 2022). The digital age has opened new avenues for entrepreneurs and those with the high entrepreneurial intention are more likely to exploit these opportunities. Intentions are often rooted in behavioral and attitude theories which are considered crucial predictors of planned behavior especially for actions that are challenging to observe. Personal traits, cultural values and environmental elements all contribute to shaping entrepreneurial intentions. Education including involvement in EE programs is a significant influencer which is equipping individuals with the knowledge and self-assurance needed for entrepreneurial pursuits (Liñán & Fayolle , 2015). Overall the interplay of factors including individual, cultural and environmental factors underscores the complexity of

entrepreneurial intention and its crucial role in motivating the entrepreneurial behavior in the evolving landscape of the digital age.

2.1.2 DE

Digitalization has become one of the main forces behind the entrepreneurship in recent years. Digitalization is considered to be the process of changing the business models and available processes through the usefulness of digital technologies. The practise of DE is growing in popularity as more and more business owners use digital technologies to develop new and globally scalable business models and opportunities (Kraus, Palmer, Kailer, Kallinger, & Spitzer, 2018). Entrepreneurship has a definition which is "the discovery, evaluation and exploitation of the future goods and services" that are not yet known by the market. It is an often quoted definition (Shane, S. A. , 2003). This idea becomes DE when it is applied to the digital environment. It entails finding and seizing new opportunities which are mostly in online platforms and the digital ecosystem (Kraus, Palmer, Kailer, Kallinger, & Spitzer, 2018). It usually entails the development of digital goods or services, with technology and the internet acting as key instruments. A few examples of these can be such as mobile apps, e-commerce websites, and digital marketing firms. In addition to that the DE is described as "the creation of new businesses or transformation of existing ones through the development and use of digital technologies that is often enabled by internet and software applications" (Amy Cosby, 2023). This places a strong emphasis on technology because DE primarily depends on the using of digital tools and techniques to innovate and generate revenue in the digital sphere (Mpofo , 2023). A further aspect of DE can be seen as the creative application of digital technology to the business models and procedures. The use of digital technologies used to "reinvent business models, enhance processes, and create value propositions" is included (Dominic Chalmers, 2021). In order to obtain a competitive edge or promote disruptive innovations the DE may involve integrating big data, blockchain, artificial intelligence, or the Internet of Things (IoT) into already existing business structures. This further expands the definition to include established businesses' digital transformation as well as startups or new ventures (Hasnain Zaheer, 2019). In contrast to this the tech entrepreneurship is focused only on the creating and promoting novel technology products, including software, hardware, and digital innovations. It entails developing novel technologies and solutions, many of which call for extensive technical study and development. Tech entrepreneurs are passionate about creating

disruptive technological innovations and resolving difficult technical problems. Businesses in this field concentrate on creating cutting-edge hardware, software, biotechnology, artificial intelligence, fintech, and other technologies (Moritz, Block, & Lutz, 2019).

Digital entrepreneurs have access to global markets, customers, and resources which can be enabling them to compete with traditional businesses on a level playing field (Elia, et al., 2020). Traditional entrepreneurship to DE shift is pretty evident in the changing nature of the businesses. Digital technologies have made it even easier to create new business models that are proving more effective and scalable (Sahut, et al., 2021). A distinct skill set is currently needed for DE which include the familiarity with social media marketing, data analytics, and digital technologies.

There are numerous industries and economies which have been seeing radical change as a result of the DE. It has upended a established sectors which is giving rise to the fresh business concepts and altering value chains (Bican & Brem , 2020). The e-commerce companies like Amazon have transformed retail. Whereas the digital platforms like Uber and Airbnb have transformed the travel and hospitality industries. Furthermore by giving people from different places and backgrounds the chance to participate in the global digital economy the DE has been able to promote the inclusive economic growth (Mpofu , 2023). It has also fueled overall economic development by fostering innovation, productivity growth, and the creation of jobs.

This section highlights the transformative impact of digitalization on entrepreneurship which is giving rise to the phenomenon of the DE. DE involves the use of digital technologies which used to create new businesses, opportunities and innovative business models. The shift to DE is evident from the changing nature of businesses with digital technologies facilitating global market access, scalability and a level playing field for the entrepreneurs. However the DE can come with challenges which include intense competition, market saturation and concerns about cybersecurity and data privacy. Despite all these challenges it can be seen that the DE offers substantial opportunities, fostering economic growth, innovation and the job creation. Moving forward the study aims to explore the impact of EE on students' intentions to exploit business opportunities using digital technologies and platforms. Which would be contributing to the evolving landscape of DE research.

2.1.3 DEI

One essential component of entrepreneurship is the intention. It usually speaks to the person's drive and willingness to partake in an entrepreneurial endeavours. The people who have a strong desire to become entrepreneurs are more likely to take advantage of the new opportunities presented by the digital age (Cindy Millman, 2010). The individual's deliberate and planned choice to partake in the entrepreneurial activities is referred to as their entrepreneurial intentions. The purpose of this review of the literature is to investigate the main causes and consequences of entrepreneurial intentions as well as the influence of cultural and educational factors (Nguyen & Nguyen, 2023).

The mindset and goals of people to launch and grow digital businesses in the modern digital economy are referred to as DEI (Alkhalaileh, 2021). To understand digital entrepreneurial intentions has now become a crucial area of research. It is due to the growing significance of digital platforms and the increasing influence of technology (Farani, et al., 2017). The Theory of Planned Behavior is a well known theoretical framework that has been extensively used to investigate the intentions of digital entrepreneurs (TPB). Subjective norms describe the perceived social pressures and expectations surrounding digital entrepreneurial behavior. The attitude describes how someone feels about DE. Perceived behavioural control describes how someone feels about how normal or difficult it is to engage in the digital entrepreneurial activities (Wibowo & Narmaditya, 2022).

The additional factors that has been identified by other studies are technological in nature such as the familiarity with digital tools and platforms, DL and technological readiness (Nambisan, 2017). Personal traits and characteristics such as self-efficacy, risk-taking propensity and innovativeness have also been found to influence digital entrepreneurial intentions (Elnadi & Gheith, 2023). These intentions have been linked to an actual engagement in DE and the success of digital ventures (Kraus, et al., 2018). Liñán and Fayolle (2015) have highlighted the significance of perceived desirability and feasibility as key factors affecting DE intention. Additional to that it has been discovered that personal traits are very important in determining DEI.

It is crucial to study DEI aspect in understanding the dynamics of contemporary business landscapes shaped by digital technologies. The scholars are now increasingly recognizing the significance of DE then exploring individuals' intentions to engage in this realm becomes pivotal. There are various factors influence entrepreneurial intentions and when applied to the digital environment they contribute to shaping the landscape of DE. Cultural factors such as individualism, risk-taking propensity and tolerance for uncertainty also influence entrepreneurial intentions in the digital context (Shane, 1992). The Global Entrepreneurship Monitor (GEM) report emphasizes the role of technology in digital entrepreneurship and further defined it as "the creation of new businesses or transformation of existing ones through the development and use of digital technologies" (GEM report). This underscores the dependence on digital tools and techniques for innovation and revenue generation in the digital sphere.

DE has transformative effects on various industries and economies with examples like Amazon, Uber, and Airbnb reshaping traditional sectors. Scholars have also noted the inclusive economic growth facilitated by DE with providing opportunities for diverse individuals to participate in the global digital economy (Bican & Brem , 2020). The potential for economic development, innovation, and job creation underscores the importance of studying the digital entrepreneurship intentions.

2.1.4 EE

The goal of entrepreneurship education is to provide people with the knowledge, abilities, and attitudes they need to thrive in the digital entrepreneurial environment. It includes a variety of interventions including workshops, courses, incubators and experiential learning opportunities (Valerio, 2014). The research has indicated that the individuals who engage in EE programmes demonstrate a greater inclination to launch digital businesses in comparison to those who do not receive such exposure (Wibowo & Narmaditya, 2022). The favourable outcome can be ascribed to the competencies and expertise obtained through the EE which augment people's comprehension of digital business models, digital marketing tactics and additional crucial facets of the digital entrepreneurial ecosystem (Sahrah, et al., 2023). Building people's self-efficacy and entrepreneurial mindset are two critical factors that determine people's intentions to pursue DE and it is made possible by EE (Elnadi & Gheith, 2023). Additionally the networking opportunities made possible by EE link aspiring digital entrepreneurs with industry

insiders, mentors, and other entrepreneurs creating a positive environment that reinforces their decision to pursue digital businesses (Polbitsyn, 2020).

Challenges exist in effectively integrating entrepreneurship education and maximizing its impact on digital entrepreneurial intentions. These challenges include the need for continuous updates and alignment of curriculum with the rapidly evolving digital landscape ensuring the relevance and practicality of the education provided (Lackéus, 2020). Entrepreneurship education has a significant positive impact on the individuals' entrepreneurial intentions. Through the acquisition of knowledge, development of skills, cultivation of an entrepreneurial mindset and access to networking opportunities EE equips the individuals with the necessary foundation to pursue ventures (Briona & DeCoito, 2023). Policymakers, educators, and stakeholders should continue to invest in EE programs and address the challenges to further enhance their impact on fostering digital entrepreneurial intentions and contributing to the growth of the digital entrepreneurial ecosystem (Lei, 2023).

Scholars (Wibowo & Narmaditya, 2022) have investigated the intricate relationship between acquiring the entrepreneurial knowledge and the skills through education and the subsequent intention to engage in digital entrepreneurial activities. In their study, Smith and Johnson (2020) observed that formal entrepreneurship education programs provide participants with a comprehensive understanding of the digital landscape which is fostering the development of skills relevant to launching and operating online businesses (Cindy Millman, 2010). This shift in how people perceive risk is a result of the skills and information that education offers as a result the people are more confident and intend to pursue DE. Furthermore, Arctadius & Nilsson (2017) investigated how self-efficacy is fostered by the EE is enabling prospective business owners to confidently carry out their business concepts and successfully navigate the digital environment. This mentality alignment consequently results in a greater propensity to investigate and partake in DE.

2.1.5 DESE

Within the field of entrepreneurship and technology-driven business endeavours we can see a growing interest in the concept of DESE or DESE (Ulfert-Blank, A. S., & Schmidt, I., 2022). People's capacity to interact with the digital tools and platforms has become crucial as technology

continues to influence many facets of contemporary life. Furthermore it has been suggested that people who have higher levels of self-efficacy in their ability to engage in the DE are more likely to experiment and explore various aspects of digital platforms. This can enhance their overall DL and lead to the development of more digital skills. The literature also highlights how contextual factors influence the development of DESE. Individuals' levels of digital self-efficacy have been found to be influenced by a number of factors which includes the age, gender, socioeconomic status and prior experience with technology. The higher educated people and younger people tend to have greater confidence in their digital skills. But the digital divide is still worrisome because they have less access to technology and digital training and marginalised groups have lower levels of DESE (Lee, 2021).

The specific function of digital entrepreneurial self-efficacy as a mediating variable between the EE and the entrepreneurship intentions is still largely unexplored. And this is despite the growing body of research analysing the relationship between various individual factors and entrepreneurship intentions. Research on the relationship between DESE and intentions for DE is crucial. Researchers can shed light on the mental processes and behavioural pathways that motivate people to adopt the digital innovations for entrepreneurial endeavours.

Research consistently demonstrates a positive relationship between DESE and digital entrepreneurial activities (Ismail et al., 2020; Mohammadi et al., 2019). A higher inclination to engage in the digital entrepreneurial endeavours such as creating digital products, e-commerce platforms, and online marketing strategies is seen. This robust correlation highlights the crucial function that digital entrepreneurial intentions perform in moulding the terrain of DE.

2.1.6 DL

Digital knowledge refers to the possession of often domain specific information, facts, and expertise related to digital technologies or a particular area within the digital landscape (Bélisle, C., 2006). It is the accumulation of knowledge about digital tools, platforms, processes, or practices. Digital knowledge can encompass the skills or information about coding, data analysis, online marketing, or any domain specific digital field. It is more focused and context specific than DL and often represents a deeper understanding of a particular facet of the digital world.

DL equips the budding entrepreneurs with the tools to understand the digital world which includes how to use digital tools and platforms, critically assess online information and interact responsibly in online spaces. This foundational knowledge is invaluable for students as it provides the necessary confidence and competence to explore and understand the DE landscape. Without DL the individuals may struggle to grasp the basics of digital business practices which would limit their ability to recognize entrepreneurial opportunities and formulate intentions to pursue digital ventures (Mithas & Lucas, 2010). DL surpasses the digital knowledge as the more useful focus in EE for shaping DEI (Akhter, et al., 2022). DL as a foundational and adaptable skill set empowers students to navigate the digital landscape effectively, build confidence, and respond to the emerging opportunities and challenges. By prioritizing DL the EE better prepares students for the dynamic world of DE (Alkhalileh, 2021).

The education sector has been a focal point for investigating the DL. Van Dijk (2006) discussed the concept of "digital skills" as a subset of DL and highlighted how these skills enable the individuals to participate in online social and civic activities. DL has also been found to positively correlate with the political online engagement and information seeking related to public affairs (Boulianne, 2015).

2.1.7 Literature Gap

Building on the research gaps identified in the previous discussions, it can be understood that following gaps exist which needs to studied.

There are many studies which have established a positive relation between EE and entrepreneurship intentions there exists a need to understand the relationship between EE and DEI (Akhter A. , Islam, Karim, & Latif, 2022). EE and DEI have been studied separately in a few studies, however the relationship between the two variables lack research. This relationship can be studied in various contexts so that the stakeholders can benefit from the study. The researchers would be able to get a more accurate picture of the variables that influence digital entrepreneurial intentions and learn how to best promote entrepreneurial education across various academic domains if an increased sample size to include a wider range of disciplines. If these gaps are addressed they would enhance the understanding of the complex relationship between education entrepreneurship and DEI and inform the design of more effective educational interventions (

Dabbous & Boustani, 2023). This gap would help understand the problem that if EE can help increase DEI which would further help the stakeholders in developing proper measures to increase DE activities. The EE programs are designed to equip individuals with the skills, knowledge and mindset required to succeed as entrepreneurs (Kuratko, 2005).

Similarly the DL plays a pivotal role in navigating the digital landscape which is fundamental for succeeding in DE. However there is a lack of empirical research that investigates whether the impact of EE on individuals' DEI is influenced by their level of DL (Alkhalaleh, Kovács, & Kovács, 2023). By exploring DL as a moderator the researchers could uncover nuanced insights into how the effectiveness of EE courses varies based on individuals' DL levels. For instance the individuals with higher DL might be more adept at translating the knowledge gained from EE into digital entrepreneurial endeavors. On the other hand the individuals with lower DL might struggle to effectively apply the concepts learned in EE within digital contexts (Mugiono & Praj, 2021).

While some researchers have vaguely explored the individual effects of EE on DEI still there is a significant literature gap in investigating DESE as a mediator in the relationship between EE and DEI (Briona & DeCoito, 2023). Simultaneously the research has shown that DESE, reflecting individuals' confidence in using the digital technologies, is crucial for effectively engaging in the DE landscape (Lackéus & Middleton, 2015). However, the limited research has delved into whether the effect of EE on DEI is mediated by DESE. Investigating digital self-efficacy as a mediator could uncover how the EE programs enhance not only domain-specific knowledge but also individuals' confidence in using digital tools to translate that knowledge into practice. For instance the individuals who undergo EE might develop a greater sense of self-assuredness in utilizing digital platforms for marketing, e-commerce, and innovation thereby strengthening their DEI (Muafi, et al., 2023).

The comprehensive literature review critically examines the interplay between the EE, DEI (DEI), DESE (DESE) and DL. Rooted in foundational perspectives from Schumpeter, Kirzner, and Shane and Venkataraman the analysis underscores entrepreneurship's transformative nature as a dynamic force in the economies. Transitioning to DE the review scrutinizes factors influencing these intentions in the digital age hence emphasizing the unique skill set required. The exploration of DESE sheds light on its importance noting its positive correlation with digital entrepreneurial

activities. The review critically considers contextual factors shaping DESE urging inclusivity in EE. DL emerges as a foundational skill set which is distinct from digital knowledge and crucial for effective navigation of the digital landscape. It advocates for empirical research on DL as a moderator and highlights the scarcity of studies on digital entrepreneurial self-efficacy as a mediator. The review critically engages with foundational perspectives, evaluating key concepts in entrepreneurship, DE and entrepreneurship education. It offers a nuanced understanding of the dynamic nature of entrepreneurship in the digital age which is paving the way for informed hypothesis development and contributing to the evolving landscape of entrepreneurship studies.

2.2 Review of Theoretical Grounding

EE has gained prominence as a means to cultivate entrepreneurial skills and attitudes (Fayolle, 2013). It plays a pivotal role in the nurturing an entrepreneurial mindset and fostering the development of an innovative business ventures. In parallel the DE is characterized by the utilization of digital technologies to create, operate and scale businesses has emerged as a dynamic and sustainable model (Hatak et al., 2015). The rapid digitalization of economies worldwide has heightened the importance of understanding the relationship between EE and digital entrepreneurship intentions. Education in the entrepreneurship is based on a number of theoretical pillars. One of them is entrepreneurial learning which is facilitated by practical experiences and introspection according to experiential learning theory (Kolb, 1984). Experiential learning theory is based on the notion that learning starts with the real-world experiences. This idea highlights how crucial it is to expose would be business owners to real world entrepreneurial settings in the context of EE. These kinds of experiences frequently come in the form of practical projects, hands-on activities or even participation in actual startups. Programs that teach entrepreneurship might encourage students to work on business simulations, take part in internships or compete in entrepreneurship. The first point of interaction with the complexities of entrepreneurship is these tangible experiences. The students get important insights that can't be learned from the textbooks alone when they are exposed to the real opportunities and challenges of the entrepreneurial world. These encounters help the students to gain a deeper comprehension of the material by allowing them to apply their theoretical knowledge. The powerful framework of experiential learning theory (Kolb, 1984) explains how the entrepreneurship education can effectively foster the growth of aspiring entrepreneurs. The best

way to learn entrepreneurship is by doing according to experiential learning theory based EE programmes. They establish settings in which students can participate in practical entrepreneurial activities, think back on their experiences, relate them to the theoretical information and use their understanding in novel entrepreneurial situations. In addition to improving students' knowledge and abilities in entrepreneurship the experiential learning theory fosters the adaptability and entrepreneurial mindset required for success in the dynamic world of entrepreneurship. It supports the idea that entrepreneurship is a journey to be experienced rather than just a subject to be studied and gives the aspirin business owners the resources they need to succeed in the fast paced world of entrepreneurship.

Another is human capital theory (Becker, 1964) which emphasizes how education can help people become more productive and employable which includes starting their own business. The fundamental tenet of human capital theory is that people can invest in themselves by learning the things that improve their productivity and earning potential. This idea is applied to the intentional investment in entrepreneurial human capital in the field of entrepreneurship. Through official education and training programmes the aspiring entrepreneurs can improve their entrepreneurial knowledge, abilities, and mindset. The programs that teach entrepreneurship provide people with the structured avenues to invest in their own entrepreneurial human capital. The courses and materials offered by these programmes are designed to help participants develop key entrepreneurial skills like financial management, market analysis, business planning, and strategic thinking (Fayolle & Gailly, 2015). Through these learning opportunities the people are prepared to handle the dynamic and complex world of entrepreneurship. According to the Human Capital Theory an individual's performance and productivity are directly impacted by the knowledge and skills they acquire. When it comes to entrepreneurship the abilities and information gained from EE programmes are crucial to a person's capacity to recognise opportunities, create winning business plans, and oversee profitable ventures. The beneficial effects of EE on skill development and entrepreneurial performance are supported by research. Heinonen and Poikkijoki's (2006) study discovered that EE has a positive impact on entrepreneurial intentions, attitudes, and skills. This highlights that how education can significantly improve a person's capacity for entrepreneurship which is consistent with the tenets of human capital theory.

The term "DEI" describes a person's propensity and drive to partake in entrepreneurial endeavours within the digital domain. Numerous factors such as perceived desirability, feasibility, and social norms influence these intentions (Ajzen, 1991). In this case the DE, a well-known psychological model called the Theory of Planned Behavior (TPB) which was created by Icek Ajzen looks at a person's beliefs, attitudes, subjective norms, and perceived behavioural control in an effort to explain behaviour (Ajzen, 1991). In the context of digital entrepreneurial intentions the TPB provides a comprehensive framework to understand what drives individuals to engage in DE. A positive outlook in the digital sphere can result from confidence in the inventiveness, adaptability, and financial gain that come with digital endeavours. When it comes to assessing digital entrepreneurial intentions the subjective norms are essential which stand for the perceived social pressure or influence from significant others.

An individual's intentions can be greatly influenced by the opinions and support of friends, mentors, family, and social networks (Liñán & Chen, 2009). The perception of strong support and encouragement from social circles is likely to reinforce the aspirations of aspiring digital entrepreneurs to pursue DE. On the other hand, their network's suspicion or disapproval may serve as a deterrent. In the TPB, perceived behavioural control is as crucial component. It speaks to a person's confidence with their ability to carry out a particular behaviour in a successful manner (Ajzen, 1991). In the context of DE it represents the person's evaluation of their capacity to successfully use digital tools, negotiate the complexity of the digital environment, and get past obstacles related to digital business endeavours. High perceived behavioural control is a strong predictor of intentions to pursue the DE because people who are committed to this path are more likely to feel confident in their ability to manage the digital entrepreneurial environment (Liñán & Chen, 2009). The Theory of Planned Behavior provides a useful conceptual framework for comprehending the intentions of digital entrepreneurs. Researchers and educators can learn more about the elements influencing people's intentions to pursue digital entrepreneurship by looking at attitudes, subjective norms, and perceived behavioural control in the context of DE. This information can help create the successful EE initiatives and interventions that give would-be business owners the encouragement and tools they need to start their own digital ventures.

The association between the EE and intentions for DE is moderated by DL or the capacity to use digital technologies efficiently (Eshet-Alkalai, 2004). It establishes the degree to which people

can apply the information and abilities they have acquired via education to engage in DE. The moderating effect of DL is consistent with previous research highlighting the significance of contextual factors (Davidsson & Wiklund, 2001) and resource availability (Shane & Venkataraman, 2000) in influencing entrepreneurial outcomes.

This research explores various theoretical frameworks underpinning entrepreneurship education and its implications for DEI. The Experiential Learning Theory (Kolb, 1984) emphasizes the significance of practical experiences in fostering entrepreneurial growth, then highlighting the dynamic and iterative nature of learning. The Human Capital Theory (Becker, 1964) underscores the role of education in enhancing individuals' productivity and employability which is crucial for entrepreneurial success. However, the TPB (Ajzen, 1985) emerges as the most suitable choice for understanding DEI. The Theory of Planned Behavior aligns well with the unique challenges and dynamics of the DE landscape by making it the most apt theoretical foundation for this research.

2.2.1 Digital Entrepreneurial Self-Efficacy, Digital Literacy, Entrepreneurship Education, and Digital Entrepreneurship Intentions

In the quickly changing digital world of today entrepreneurship has changed dramatically. Digital technologies have not only changed the way businesses function but they have also given the aspiring entrepreneurs new opportunities. The idea of "DE," which includes the use of digital tools, platforms, and strategies to create, manage, and scale entrepreneurial ventures emerged as a result of this transformation (Nambisan, 2017). Examining the interactions between different constructs including DESE, DL, EE, and DEI, is essential to developing a thorough understanding of the factors influencing people's intentions to engage in DE (Akhter A. , Islam, Karim, & Latif, 2022).

The term "DESE" describes a person's confidence in their capacity to carry out the tasks and overcome the obstacles in a digital entrepreneurial setting (Chin, 2018). Stated differently it refers to an individual's self-assurance in their ability to successfully negotiate the intricate digital terrain and realise their aspirations. DESE is an important component since it has a big impact on people's willingness to start their own digital businesses.

An individual's propensity or preparedness to start and participate in the digital entrepreneurial endeavours is reflected in their DEI. These pursuits could involve launching internet companies, employing digital marketing techniques, offering goods and services via e-commerce platforms or investigating cutting-edge digital business concepts (Reinartz et al., 2011). Intentions are a critical precursor to action. When individuals have strong intentions to engage in DE they are more likely to take concrete steps towards realizing their entrepreneurial aspirations. These steps may include market research, product development, website creation and digital marketing campaigns. Therefore understanding the factors that influence DEI is crucial for predicting and promoting entrepreneurial behavior in the digital sphere (Al-Mamary & Alraj, 2022).

Given the intricate relationships among these constructs the following hypothesis is proposed for investigation:

Hypothesis 1: EE is positively related to DE Intention.

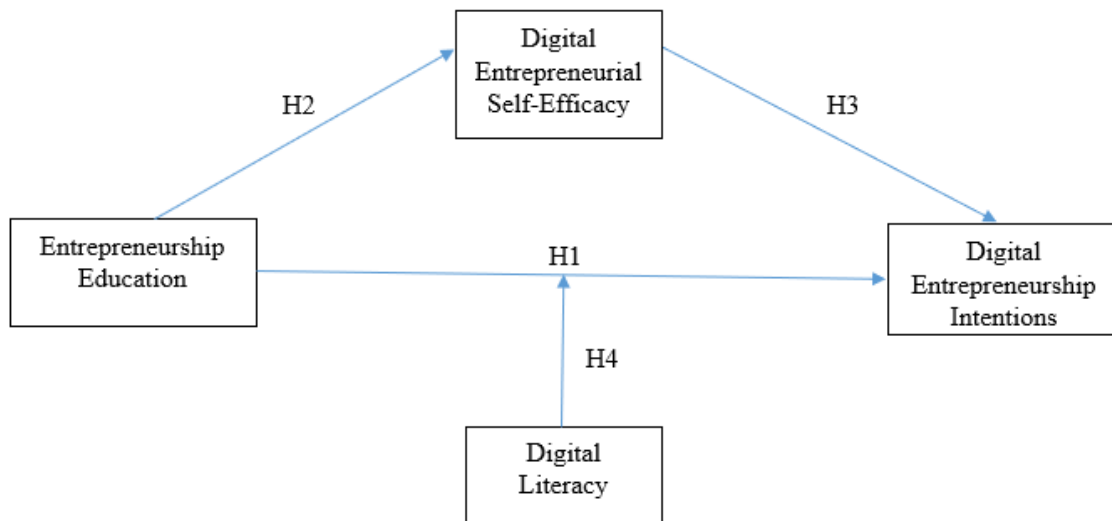


Figure 1 Conceptual Model

Figure 1 Conceptual Model

2.2.2 Entrepreneurship Education and Digital Entrepreneurial Self-Efficacy

EE has emerged as a critical component in nurturing entrepreneurial skills, fostering innovation and shaping the business landscape (Ahmad, Idrus, & Rijal, 2023). In relation with the rapid advancement of digital technologies, the concept of DESE has gained significance. DESE refers to an individual's belief in their ability to effectively leverage the digital tools and technologies for entrepreneurial activities (Darmanto S. E.). The dynamic interplay between the EE and the DESE represents an intriguing field of study. EE encompasses a range of academic and practical interventions aimed at equipping individuals with the knowledge, skills and the experiences necessary for entrepreneurial success. This educational approach is rooted in the belief that individuals can be taught and inspired to embark on entrepreneurial ventures, promoting economic growth and innovation (Fayolle, 2013). EE typically covers areas such as the idea generation, opportunity recognition, business planning, financial management, and marketing preparing individuals to navigate the complexities of the business world (Morris, 2013).

When it comes to the DE it refers to a person's self assurance in their capacity to use digital tools and technologies for jobs like data analytics, e-commerce, online marketing and digital finance. In an era where the digital landscape is integral to entrepreneurial endeavors the DESE is crucial for success. Liñán, Rodríguez-Cohard, and Rueda-Cantuche (2011) found that the EE positively impacts the entrepreneurial self-efficacy. However the limited research has directly examined the impact of EE on DESE which is particularly relevant in the digital age (Xin & Ma, 2023).

Building upon the existing literature on EE and self-efficacy this hypothesis posits that the EE positively influences an individual's DESE. It is grounded in Bandura's Social Cognitive Theory which underscores the pivotal role of SE in shaping human behavior and achievements (Bandura, 1986). EE is perceived as an intervention that enhances self-efficacy by providing the individuals with the knowledge, skills and practical experiences required for success in entrepreneurship (Hassan, 2021). This hypothesis predicts a positive relationship between the extent of EE received and the level of DESE. To test this hypothesis a quantitative research approach will be employed. Data will be collected through structured surveys from individuals who have studied at least one course of the EE. Hypothesis proposes that the EE positively influences DESE. It is founded on the premise that education equips individuals with the necessary knowledge and skills to confidently engage with the digital tools and technologies in the context of entrepreneurship. This hypothesis contributes to the understanding of how education shapes individuals' beliefs and

capabilities in utilizing digital tools which is increasingly pivotal in the evolving entrepreneurial landscape.

Hypothesis 2: EE is positively related to DESE

2.2.3 Digital Entrepreneurship Intentions and Digital Entrepreneurial Self-Efficacy

In today's rapidly evolving digital landscape the synergy between DEI and DESE has garnered significant attention (Xin & Ma, 2023). Understanding the emergence and the success of DE in the modern business world requires an understanding of the interaction among these two constructs. (Akhter A. , Islam, Karim, & Latif, 2022). Intentions for DE are a reflection of people's desires to engage in the various aspects of the digital economy including e-commerce, online marketing, app development and the provision of digital services. The acknowledgement of the potential advantages of digital business operations such as adaptability, expansion, and worldwide accessibility forms its foundation. This concept is consistent with the idea of entrepreneurial intentions in general which is useful in forecasting entrepreneurial behaviour (Krueger & Carsrud, 1993). Intentions for DE are however limited to online or digital businesses.

Conversely the people's confidence in their ability to use digital tools and technologies to effectively create, develop, and manage digital business initiatives is known as DESE. (Xin & Ma, 2023). In the context of DE the SE is particularly relevant as it relates to individuals' beliefs about their ability to navigate digital platforms, manage online marketing, utilize e-commerce technologies and leverage data analytics tools effectively (Akhter A. , Islam, Karim, & Latif, 2022). Existing literature has established that self-efficacy plays a pivotal role in shaping entrepreneurial intentions and behavior (Chen, Greene, & Crick, 1998). While this research primarily focuses on general entrepreneurship still the concept is transferable to DE where self-efficacy regarding digital tools and technologies becomes a key determinant of DEI.

Building on the foundational relationship between self-efficacy and entrepreneurial intentions this hypothesis posits that the digital entrepreneurial self-efficacy positively influences an individual's digital entrepreneurship intentions. This hypothesis aligns with Bandura's Social Cognitive Theory (1986) which emphasizes the significance of self-efficacy in shaping the human actions. In the context of digital entrepreneurship it is anticipated that individuals who possess higher levels of digital entrepreneurial self-efficacy will exhibit stronger intentions to engage in digital business activities. Hypothesis posits that the digital entrepreneurial self-efficacy is positively related to digital entrepreneurship intentions. It builds upon the established connection between self-efficacy and entrepreneurial intentions and underscores the critical role that confidence in navigating digital tools and technologies plays in motivating individuals to pursue digital entrepreneurial ventures. This hypothesis contributes to our understanding of the factors that drive the emergence and success of digital entrepreneurship in the digital age.

Hypothesis 3: Digital Entrepreneurial Self-Efficacy is positively related to DEI

2.2.4 Entrepreneurship Education, Digital Entrepreneurship Intentions and Digital Entrepreneurial Self-Efficacy

In the contemporary business landscape the intricate dynamics among EE, DEI and DESE are of paramount importance (Xin & Ma, 2023). While DEI serve as the driving force behind engaging in digital business activities the EE provides people with the knowledge and abilities to successfully navigate the world of entrepreneurship.

The belief that one can use digital tools and technologies for entrepreneurial purposes effectively is referred to as DESE (Darmanto S. E., 2022). Comprehending the interplay among these three constructs is imperative in order to grasp the dynamic landscape of DE. To prepare people for entrepreneurship the EE is a multimodal approach that blends theoretical and practical components. It includes things like coming up with ideas, spotting opportunities, planning a business, and handling finances (Fayolle, 2013). A key element in forming entrepreneurial intentions is EE as it cultivates an entrepreneurial mindset by motivating people to pursue novel opportunities and overcome obstacles.

This suggests a complicated hypothesis between these constructs. The relationship between entrepreneurship education and intentions for digital entrepreneurship may be influenced by the mediation effect of digital entrepreneurial self-efficacy. Its foundation is Bandura's Social Cognitive Theory (1986) which emphasises how crucial self-efficacy is in determining how people behave and act. Self-efficacy emerges as the crucial component in the context of digital entrepreneurship that bridges the gap between the influence of entrepreneurship education on entrepreneurial intentions. The interactive impact of entrepreneurship education and intentions is said to be mediated by digital entrepreneurial self-efficacy according to the hypothesis. In order to further the understanding of how these constructs jointly influence the emergence and success of digital entrepreneurship in the digital age it draws on the connections between entrepreneurship education, self-efficacy and intentions that have already been established. This hypothesis emphasises the role that education plays in cultivating entrepreneurial mindsets and skill sets in a digital context as well as the importance of self-efficacy in the entrepreneurial process.

Hypothesis 4: DESE mediates the interactive effect of EE and DEI

2.2.5 Role of Digital Literacy

The significance of DL lies in its function as a catalyst that connects these two domains. A strong grasp of digital tools and technologies empowers individuals to fully exploit the opportunities presented by DE (Amy Cosby, 2023). It enables them to effectively navigate e-commerce platforms, employ digital marketing strategies, harness the potential of big data and analytics and adapt to the rapidly evolving digital landscape which is all fundamental aspects of DE. Therefore the DL is a pivotal enabler which is facilitating the translation of knowledge acquired through EE into actionable DEI (Singh R. &, 2022).

Building upon the importance of digital literacy in the context of digital entrepreneurship, this hypothesis proposes that digital literacy moderates the relationship between entrepreneurship education and digital entrepreneurship intentions. In essence the extent to which entrepreneurship education influences an individual's digital entrepreneurship intentions is contingent on their level of the digital literacy. Hypothesis suggests that digital literacy moderates the relationship between entrepreneurship education and digital entrepreneurship intentions. This hypothesis underscores the vital role of digital literacy as a determining factor that shapes the impact of education on entrepreneurial intentions particularly in the digital realm. It emphasizes that individuals with higher levels of digital literacy are better equipped to effectively translate the knowledge and skills acquired through the entrepreneurship education into tangible and actionable plans for digital entrepreneurship. In doing so this hypothesis contributes to the understanding of the intricate dynamics at play in the domain of digital entrepreneurship highlighting the role of digital literacy as a pivotal enabler.

Hypothesis 5: DL moderates the relationship between EE and DEI such that if DL is high, then the relationship between entrepreneurial education and digital entrepreneurial intentions will be strengthened.

2.2.6 Hypothesis development

The model encompasses 5 hypotheses such as,

- i) EE is positively related to DE Intention,
- ii) EE is positively related to DESE,
- iii) DESE is positively related to DEI,
- iv) DESE mediates the interactive effect of EE and DEI
- v) DL moderates the relationship between EE and DEI such that if DL is high, then the relationship between entrepreneurial education and digital entrepreneurial intentions will be strengthened.

2.2.7 Conclusion

This comprehensive exploration of the theoretical foundations provides a robust framework for understanding the relationships among entrepreneurship education, digital entrepreneurship intentions, digital entrepreneurial self-efficacy, and digital literacy. The theoretical grounding encompasses key concepts such as Experiential Learning Theory, Human Capital Theory, and the Theory of Planned Behavior, each contributing to a nuanced understanding of the dynamics at play in the context of entrepreneurship education and digital entrepreneurship. Experiential Learning Theory underscores the significance of practical experiences in fostering the entrepreneurial growth emphasizing the dynamic and iterative nature of learning. Human capital theory highlights the role of education in enhancing individuals' productivity and employability which is crucial for entrepreneurial success. The Theory of planned behavior emerges as a fitting choice for understanding digital entrepreneurship intentions by offering a comprehensive framework that addresses attitudes, subjective norms and perceived behavioral control. The subsequent hypotheses extend the theoretical foundations into empirical investigation exploring the relationships among these constructs. The proposed hypotheses posit positive relationships between entrepreneurship education and digital entrepreneurial self-efficacy, digital entrepreneurial self-efficacy and digital entrepreneurship intentions, and entrepreneurship education and digital entrepreneurship intentions. Additionally, a mediation hypothesis suggests that the digital entrepreneurial self-efficacy mediates the interactive effect of entrepreneurship education and digital entrepreneurship intentions.

Furthermore, the role of DL is introduced as the moderator in the relationship between the EE and DEI. This theoretical and empirical framework provides a structured approach to investigating the complex interplay of factors influencing the emergence and success of DE in the contemporary landscape. By bridging theoretical perspectives with empirical research this study aims to contribute valuable insights to the field informing EE practices and the strategies for fostering DEI in individuals. The conceptual model presented in Figure 1 encapsulates these relationships, forming the basis for empirical testing and analysis. Overall this research seeks to advance the understanding of the intricate dynamics that drive DE in the digital age with implications for policymakers, educators, and aspiring entrepreneurs in the context of Pakistan's evolving entrepreneurial ecosyste

Chapter 3

Methodology

3.1 Introduction

In this chapter, the research philosophy, quantitative approach, and sampling strategy are meticulously examined to provide a robust foundation for understanding the intricacies of the relationship between EE and DEI. The research philosophy is rooted in an objective ontology, indicating an exploration of social constructs independently of subjective interpretations, aligning with a realist or objectivist perspective. Complementing this ontological stance is a positivist epistemology, asserting that observable reality can be objectively studied to yield generalized results untainted by human biases. This philosophical framework guides the subsequent adoption of a quantitative research approach, a deductive methodology chosen to organize data into generalizable and statistical forms. Quantitative research is chosen for its focus on numeric data and convergent reasoning, making it imperative for the study's objectives. The sampling strategy, a critical component of the research design, justifies the use of a stratified sampling approach. This method ensures a nuanced analysis of the relationship between EE and DEI across diverse subgroups within the Pakistani population.

The chapter elucidates the rationale behind this choice, emphasizing the need for comprehensive insights into variations across different strata. It further details the sample design, delineates the process of data collection, and underscores ethical considerations to provide a comprehensive understanding of the methodological underpinnings of the study.

3.2 Research Philosophy

Research is an educational process in which research is conducted to comprehend, characterise, and predict anything (Anderson, 2005). This study is following the objective ontology focusing on the social construct independent of social actors and is also independent of its interpretations which is also known as objectivist (Saunders, Lewis and Thornhill 2009) or realist (Neuman 2011). The term positivism encapsulates that the observable reality is based on grounded philosophical stance that aims generalized results focusing on the pure data and is not affected by any human

biases (Alharahsheh, & Pius, 2020; Junjie & Yingxin, 2022). Therefore, the epistemology would be on the factors that are measurable which will further help in creation of meaning in the data, developing a casual or correlational relationship (Scotland, 2012). The study employs a cross-sectional model with a self-administered questionnaire, ensuring a rigorous and standardized methodology for data collection. As per the methodology of research, and according to the need of the quantitative study, a detailed cross-sectional model was applied using a self-administered questionnaire (Appendix), the questionnaire duly approved by the department review committee of NBS (Nust Business School).

3.3 Choice of quantitative approach

Quantitative research approach is the appropriate choice as the topic demands the adoption of deductive approach for organization of data into generalizable and statistical forms (Babbie, 2015). The adoption of a quantitative approach is imperative for organizing data into generalizable and statistical forms, as demanded by the deductive reasoning required for the study's objectives (Babbie, 2015). The quantitative research method gives results of a wider target audience perfectly capturing the intricate relationship of the variables involved in the study.

3.4 Sample

3.4.1 Sample strategy:

In the context of the current research, the utilization of a stratified sampling strategy is justified by the need to ensure comprehensive and representative insights into specific subgroups within the population. The study aims to explore the intricate dynamics between EE and DEI in the Pakistani context. Recognizing the potential variations in perceptions, motivations, and behaviors across different segments of the population, a stratified sampling approach will be employed to divide the population into distinct strata based on the year and university of their graduation and, such as educational backgrounds, geographic locations, and demographic factors. This approach ensures that each stratum is adequately represented in the sample, allowing for a more nuanced analysis of the relationship between EE and DEI within diverse subgroups. By capturing the heterogeneity within the population, the study aims to enhance the external validity of its findings, providing a more robust foundation for drawing meaningful and applicable conclusions that can be generalized to the broader Pakistani population.

3.4.2 Sample size:

The total population size was calculated to be approximately 6500 by adding the total number of seats available for the engineering programs in each university per year and multiplying by 2 for both years². As per Morgan's table, the statistical population size of 6500 would need a sample size of 375 students.

3.4.3 Respondents:

To assess our hypothesis, we collected our data from engineering graduates of 2022 and 2023 from top 5 universities according to QS World ranking of Pakistan including NUST, PIEAS, UET, LUMS, and COMSATS³.

University Name	Pakistan Rank 2023	World Rank 2023
National University of Sciences And Technology (NUST) Islamabad	1st	334
Pakistan Institute of Engineering and Applied Sciences (PIEAS)	3rd	390
Lahore University of Management Sciences (LUMS)	4th	601-650
University of Engineering & Technology (UET) Lahore	5th	801-1000

² <https://www.paklearningspot.com/2021/12/nust-university-number-of-seats.html>
<http://www.pieas.edu.pk/news/20180607.cshhtml>
<https://lahore.comsats.edu.pk/admissions.aspx>
https://sbasse.lums.edu.pk/sites/default/files/inline-files/Undergraduate%20Student%20Handbook_2020-2021.pdf
https://admissions.uettaxila.edu.pk/Seats_Allocation.php

³ <https://www.topuniversities.com/world-university-rankings/2023?region=Asia&countries=pk>

COMSATS University Islamabad	8th	1001-1200
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These universities are selected for providing main engineering degrees including BS Computer Science, BS Computer Engineering, BS Electrical Engineering, etc. Pakistan is designated for the existing research study because of the significant growth in its DE. Selecting 2022 and 2023 engineering graduate students from 5 of the top 10 universities in Pakistan with major engineering programs, as per the QS World Rankings, for the study on the relationship between EE and DEI is a prudent choice. These universities, renowned for their academic excellence and rigorous coursework (QS World University Rankings, 2023), offer a pool of students who have completed relevant coursework including an entrepreneurship course, providing a strong academic foundation for research (QS World University Rankings, 2023). Additionally, their access to state-of-the-art research facilities, libraries, and academic resources enhances the research's depth and quality. The diverse student body from different backgrounds and regions fosters varied perspectives. These universities also promote research culture, ensuring motivated and research-oriented students. Moreover, their commitment to digital technology aligns with the study's focus, and the students are likely to possess a baseline level of DL (QS World University Rankings, 2023). The prestige associated with these institutions enhances the research's credibility and recognition (QS World University Rankings, 2021). The unit of analysis are engineering graduates of each university. Engineering students are well-equipped with analytical and problem-solving skills, essential for conducting rigorous research (Stefan Vorbach, 2019). Their familiarity with technology and innovation aligns with the DE aspect of the study (Stefan Vorbach, 2019). Furthermore, engineering students often have exposure to multidisciplinary approaches, making them adaptable to various research paradigms (Primario, Rippa, & Secundo, 2022). This specialization ensures that the selected students are not only academically competent but also possess the technical acumen required to delve into the intricate dynamics of DE and its relationship with DL. Thus, this targeted approach enhances the study's precision and relevance to the field.

3.4.4 Collection of data:

Social media and emails were used as a medium to disseminate the questionnaire. However, a few surveys were filled out through formal visits to some approachable students. To reduce desirability

bias, a cover letter was attached mentioning the goals of the study, to ensure the respondents are communicated that participation is voluntary, confidentiality was maintained, and data wasn't shared with anyone, the anonymity was protected, and aggregate treatment of data was practiced.

3.4.5 Received surveys:

The questionnaire reached approximately 700 students out of which a total of 426 responses were collected. After separating the complete questionnaires, 375 were selected for the data analysis. Response rate was calculated to be 61%.

	Details
Location	Pakistan
Method	Structured Questionnaire
Sample Size	375
Time duration of data collection	October 2023 – December 2023
Gender	Female: 137 Male: 238
Graduation year	2023: 219 2022: 156
University	NUST: 150 PIEAS: 45 LUMS: 40 UET: 60 COMSATS: 80

The different numbers of responses for each university was taken so that an equal representation of each stratum can be taken in comparison to the total population of that stratum.

3.4.6 Ethical consideration:

It was made sure to keep the content validity by involving academics, university experts (field experts), to review the questionnaire at each point which will be then refined according to the comments. Initially, we conducted pilot testing approach, randomly selected 80 students, and getting the data from them, afterwards, final tweaking in the questionnaire was done based on the responses before starting the data collection properly. We checked the reliability using Cronbach alpha, and after finalization, a highly structure questionnaire with eloquent content, comprehensibility and wording was administered into the wide range of engineering students in the top universities of Pakistan.

3.5 Measures/Instruments:

A five-point Likert scale which was used measured the constructs and are adapted according to current study. Pre-developed and pretested and validated measures were adapted to measure the concerned variables. Items used in the survey instruments to measure the constructs are: EE, DEI, DL, and DESE.

3.5.1 Entrepreneurship Education (EE):

Entrepreneurship education variable was measured 6 items scale. For this study, entrepreneurial knowledge acquisition (EKA) was selected as the dimension for measuring entrepreneurship education. EKA is essential for developing entrepreneurs' skills and knowledge. Through acquiring education and training, this knowledge makes entrepreneurs able to confront various business environmental challenges. The provision of EKA develops the mentality approach of entrepreneurs to create and grow their entrepreneurial learning and growth-oriented businesses.

The items were adopted from Lorz (2011), as used by Puni et al. (2018) and modified to use in the research.

3.5.2 Digital Entrepreneurship Intentions (DEI):

DEI are measured by using 6 items developed by Wibowo, A., Narmaditya, B.S., Saptono, A., Effendi, M.S., Mukhtar, S. and Mohd Shafiai, M.H., 2023.. This scale captures essential aspects

of aspirations, beliefs, and future plans related to DE, providing insights into how EE influences students' intentions in the digital business domain.

3.5.3 Digital Entrepreneurial Self-Efficacy (DESE):

DESE (DESE) is measured with a scale including 5 items developed by Cai et al., 2021; Elnadi & Gheith, 2021; Jiatong et al., 2021; Soomro & Shah, 2022; Wu et al., 2022. This scale is valuable for measuring DESE, as it covers a range of factors that are pivotal for success in DE. Each item reflects an aspect of self-belief and perceived capability, which are central components of self-efficacy and play a critical role in influencing entrepreneurial intentions and actions in the digital business domain.

3.5.4 Digital Literacy (DL):

DL is measured using 6 items scale developed by Primahendra, et al (2021). Given that it encompasses a wide range of abilities and proficiencies linked to the efficient use of digital tools and platforms, this scale is an invaluable tool for assessing DL. Each item reflects a specific dimension of DL, from basic information retrieval to advanced capabilities in information management, creativity, and online learning. Assessing these aspects provides valuable insights into an individual's digital literacy and proficiency in navigating the digital landscape.

Chapter 4

Results

The quantitative findings of this research are elaborated in this chapter. A descriptive analysis was done followed by reliability analysis. Outcomes of correlation analysis were quantified and analyzed afterwards. Finally, a confirmatory factor analysis was performed using AMOS and findings were presented. Process macro results were analyzed for the confirmation of the hypotheses presented in the research.

4.1 Descriptive Statistics

Table 1 Descriptive Statistics of Variables

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
EE	375	1.67	5.00	3.3182	.84576
DEI	375	2.00	5.00	3.4613	.93866
DESE	375	2.00	4.80	3.5179	.63387
DL	375	1.67	5.00	3.6551	.69493
Valid N (listwise)	375				

The descriptive tests offers the central tendencies and the variations which are present in the key variables. According to the results of the descriptive statistics mean value and standard deviation of the EE scale is to be measured as 3.3182 and .84576 respectively. It shows lesser level of variability within the variable. According to the DE intention scale the mean value is 3.4613 and standard deviation value is .93866 which indicates that variability is slightly higher. While on the other hand DESE, DL, mean values are 3.5179, 3.6551 and standard deviation values are .63387, .69493 respectively indicating lesser variations among these variables.

4.2 Reliability Statistics

Table 2 Reliability Statistics

Variable	N of Items	Cronbach Alpha
Entrepreneurship Education	6	.860
Digital Entrepreneurship Intentions	6	.991
Digital Entrepreneurial Self-Efficacy	5	.707
Digital Literacy	6	.755

The reliability analysis confirms the consistency of all items of this scale. As per Hair et al. (2010), minimum value of Cronbach Alpha for any scale item to be acceptable is 0.7. As exhibited in Table, Cronbach Alpha value for EE variable having 6 items is 0.860, for DEI is 0.991 with 6 items, for DESE is 0.707 which has 5 items, and for DL the reliability value is 0.755 with 6 items. The findings of the reliability analysis confirms the dependability of the data collected for the variables which further reinforces the credibility of the constructs under investigation. It was specifically necessary to include reliability analysis to the study as it was crucial to ensure that all the variables including EE, DE intention, DESE and DL are consistent and reliable which would strengthen the overall validity of the study.

4.3 KMO and Barlett's Test

KMO is a test employed to assess how good the components justify one another in terms of partial correlation among those components. KMO values of 1.0 or close are considered as excellent, although those below 0.5 are considered unacceptable. Majority of scholars now insist that factor analysis should begin with a KMO value of at least 0.70. Indices of Factorial Simplicity can be determined as per the following table: Kaiser, H. F., & Rice, J. (1974)

Table 3 Evaluation Criteria for KMO and Barlett's Test

in the .90s	Marvelous
in the .80s	Meritorious
in the .70s	Middling
in the .60s	Mediocre
in the .50s	Miserable
below .50	Unacceptable

Results shown below indicate a KMO value of 0.880 which indicates that there is a substantial degree of data overlay or a high partial correlation among the variables. So, it makes sense to run a factor analysis.

Table 4 Values of KMO and Barlett's test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.880
Bartlett's Test of Sphericity	Approx. Chi-Square	4978.073
	df	253
	Sig.	.000

This test is important for the study as it ensures the relatedness among the variables under study. KMO test ensured that the data is relevant enough to move further for analysis as the data is interrelated and appropriate for analysis.

4.4 Correlation Analysis

Purpose of performing a correlation analysis is to quantify the strength of relationship among all the variables of a model. The relationship between 2 variables can either be negative or positive and the value of correlations coefficient ranges from +1 to -1. A value close to +1 indicates a strong positive correlation between the two variables. On the other hand, if the value is close to -1, it shows that there exists a strong negative correlation between the said variables. However, a value close to 0 exhibits no relationship between the two analysed variables (Saunders et al., 2011).

Table 5 Correlation Analysis of the Variables

		Correlations			
		Entrepreneurship Education	Digital Entrepreneurship Intention	Digital Entrepreneurial Self Efficacy	Digital Literacy
Entrepreneurship Education	Pearson Correlation	1	.819**	.743**	.651**
	Sig. (2-tailed)		.000	.000	.000
	N	375	375	375	375
Digital Entrepreneurship Intention	Pearson Correlation	.819**	1	.893**	.811**
	Sig. (2-tailed)	.000		.000	.000
	N	375	375	375	375
Digital Entrepreneurial Self Efficacy	Pearson Correlation	.743**	.893**	1	.757**
	Sig. (2-tailed)	.000	.000		.000
	N	375	375	375	375
Digital Literacy	Pearson Correlation	.651**	.811**	.757**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	375	375	375	375

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

According to the correlation results, Pearson correlation value of 0.819 indicates a strong positive relationship between EE and DEI. Similarly, Digital Entrepreneurial-Self Efficacy has a strong positive relationship with both EE and DEI as exhibited from their correlation values of 0.743 and 0.893 respectively. DL positively affects EE, DEI, and DESE as evident from their correlation values of 0.651, 0.811, and 0.757. Correlation analysis was significant for this research as it provided quantifiable data proving the relationship between the important variables involved.

4.5 Factor Analysis

To determine the link between all of the variables in a given dataset, factor analysis is most frequently performed. Less than 50% cumulative value is acceptable and as elaborated below, cumulative % for this model is 28.639% indicating model is acceptable.

Table 3 Total Variance

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	6.587	28.639	28.639	6.587	28.639	28.639	4.035	17.541
2	3.663	15.927	44.566	3.663	15.927	44.566	3.880	16.870	34.412
3	2.506	10.895	55.462	2.506	10.895	55.462	3.641	15.831	50.243
4	2.123	9.230	64.692	2.123	9.230	64.692	3.323	14.450	64.692
5	.927	4.030	68.723						
6	.779	3.386	72.108						
7	.668	2.905	75.014						
8	.598	2.599	77.612						
9	.588	2.558	80.171						
10	.522	2.269	82.440						
11	.490	2.129	84.569						
12	.451	1.962	86.531						
13	.418	1.816	88.346						
14	.365	1.586	89.932						
15	.360	1.566	91.498						
16	.324	1.408	92.906						
17	.307	1.334	94.241						
18	.303	1.319	95.559						
19	.270	1.176	96.735						
20	.230	.999	97.734						
21	.220	.955	98.690						
22	.186	.810	99.500						
23	.115	.500	100.000						

Extraction Method: Principal Component Analysis.

Factor analysis is important for the research as it ensures that data has the right number of factors i.e the number of variables involved in the study. From the results of factor analysis, it can be seen that there are factors identified by the test and 4 variables are involved in the study as well.

4.6 Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) is specifically employed to assess the validity of a measurement model, as highlighted by Brown and Moore (2012). It is a type of structural equation modelling and serves a range of purposes including construct validation and confirming the validity and credibility of a model.

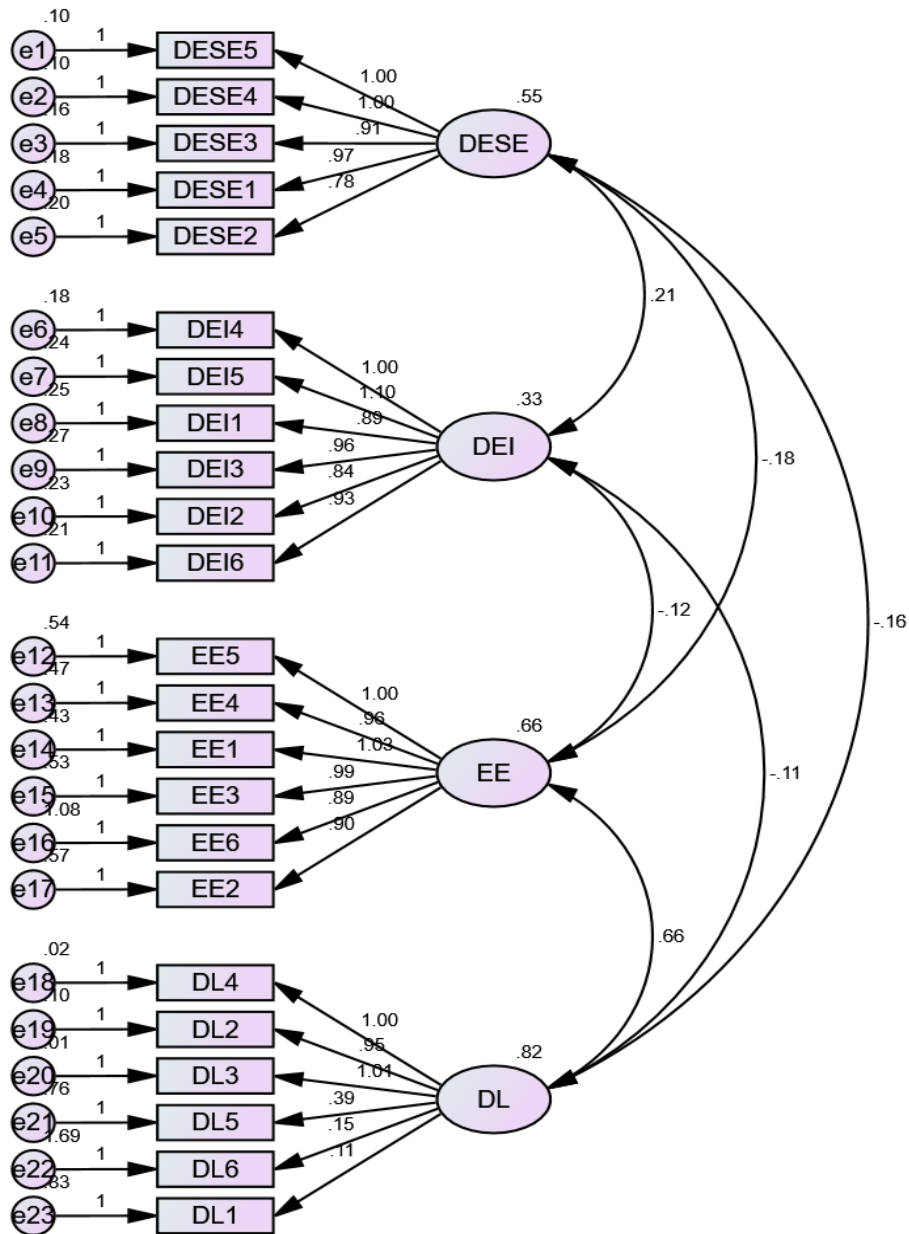


Figure 2 Confirmatory Factor Analysis Model on AMOS

Table 4 Total Variances

Constructs	Items	Loadings	AVE	CR
Education Entrepreneurship	EE1	.432	0.569	0.887
	EE2	.566		
	EE3	.534		
	EE4	.467		
	EE5	.545		
	EE6	1.077		
DEI	DEI1	.246	0.599	0.899
	DEI2	.231		
	DEI3	.271		
	DEI4	.176		
	DEI5	.243		
	DEI6	.213		
DESE	DESE1	.175	0.744	0.935
	DESE2	.201		
	DESE3	.159		
	DESE4	.098		
	DESE5	.103		
DL	DL1	.832	0.535	0.869
	DL2	.100		
	DL3	.008		
	DL4	.021		
	DL5	.756		
	DL6	1.692		

In the provided dataset, each construct is evaluated based on specific items, with corresponding item loadings, Average Variance Extracted (AVE), and Composite Reliability (CR) values. For the education entrepreneurship construct, individual item loadings, such as EE1 (0.432), EE2 (0.566), EE3 (0.534), EE4 (0.467), EE5 (0.545), and EE6 (1.077), showcase the varying contributions of each item. The AVE for education entrepreneurship is 0.569, indicating that approximately 56.9% of the variance in the items is explained by the construct. The high CR value of 0.887 underscores the internal consistency of the items within this construct. Similarly, for DEI, item loadings such as DEI1 (0.246), DEI2 (0.231), DEI3 (0.271), DEI4 (0.176), DEI5 (0.243), and

DEI6 (0.213) are reported. The AVE for this construct is 0.599, suggesting a substantial shared variance among the items. The CR value of 0.899 further indicates strong internal consistency. DESE is assessed with item loadings like DESE1 (0.175), DESE2 (0.201), DESE3 (0.159), DESE4 (0.098), and DESE5 (0.103). The AVE for this construct is notably high at 0.744, indicating a considerable proportion of shared variance. The CR value of 0.935 reflects exceptional internal consistency. The DL construct exhibits item loadings for DL1 (0.832), DL2 (0.100), DL3 (0.008), DL4 (0.021), DL5 (0.756), and DL6 (1.692). While the first two items have lower loadings, others contribute substantially. The AVE is 0.535, denoting moderate convergent validity, and the CR is 0.869, indicating reliable internal consistency.

Confirmatory factor analysis proved to be an important test for this study as it proved the variables align with their constructs by analyzing the factor loadings, AVE and CR.

Table 5 Model Fit Measures

Measure	Estimate	Threshold	Interpretation
CMIN	489.953	--	--
DF	224	--	--
CMIN/DF	2.187	Between 1 and 3	Excellent
CFI	0.959	>0.95	Excellent
SRMR	0.048	<0.08	Excellent
RMSEA	0.056	<0.06	Excellent
PClose	0.061	>0.05	Excellent

Congratulations, your model fit is excellent!

Cutoff Criteria*

Measure	Terrible	Acceptable	Excellent
CMIN/DF	> 5	> 3	> 1
CFI	<0.90	<0.95	>0.95
SRMR	>0.10	>0.08	<0.08
RMSEA	>0.08	>0.06	<0.06
PClose	<0.01	<0.05	>0.05

According to the structure equation model for CFA it is observed that the ratio of chi square minimum to the degree of freedom C_{MIN} / D_f value is 2.187, which is acceptable as the values lie between 1 to 5, which are proposed values as per Hair (2009). Another index which is used, named

as RMSEA, which indicates the goodness of fit as its value is less than 0.06 and we observed the RMSEA value from our model is 0.056. CFI index is one of the comparative indices which is considered acceptable when its value is in between .9 to .95 while if its value is greater than .95, the model is considered to be excellent model. In this case, CFI index is 0.959, which validates the fitness of the model. The optimal values of SRMR for the model to be excellent is less than 0.06 whereas our model's value is 0.048 which shows that the model is excellent. Pclose value for our model is 0.061 which is considered excellent as it should be greater than 0.05. Square equation model is crucial for this research as proves that data collected for constructs have right values for different ratios.

4.7 Hypothesis Testing via Process Macro

The social, health, and business sciences often use Process Macro to approximate direct and indirect properties in single and multiple mediator models (parallel and serial), simple slopes, two- and three-way interactions in moderation models, and sectors of importance for searching interactions, and conditional indirect effects in moderated mediation models with a single or multiple mediators or moderators. For this study, model 5 was used which is mediation with moderated direct path. All variables were fed into the model, i.e., entrepreneurship education as independent variable, digital entrepreneurship intentions as dependent variable, digital entrepreneurial self-efficacy as mediating variable, and digital literacy as moderating variable. The results support all the hypothesis presented in this research.

The results clearly state entrepreneurship education (EE) positively impacts digital entrepreneurship intentions (DEI) ($\beta=0.33$, $p<0.001$) supporting H1 hypothesis as indicated in table. Entrepreneurship education has positive impact on digital entrepreneurial self-efficacy (DESE) ($\beta=0.5567$, $p<0.001$) which supports H2 hypothesis. Analyzing the results we can see that DESE positively affects DEI ($\beta=0.7132$, $p<0.001$) validating the H3 hypothesis. The study assessed the mediating role of digital entrepreneurial self-efficacy (DESE) on the relationship between entrepreneurship education and digital entrepreneurship intentions.

The results revealed a significant indirect effect of EE on DEI through DESE ($b= 0.3971$, $t= 0.3322$), supporting H4 hypothesis. To test the hypothesis that the DL moderates the relationship

between EE and DEI, hayes process macro was utilized. These moderating effect (EE*DL) accounted for a significant amount of variance in DEI (at 5% confidence interval) amount of variance in DEI, $R^2 = 0.0011$, $p = 0.000$. 0.11% change in the DEI can be accounted to the interaction term. The results revealed a positive moderating role of DL on the linkage between EE and DEI. This shows that a higher level of DL, the impact of EE on DEI is strengthened proving the H5 hypothesis correct.

Table 6 Process Macro Results for Hypothesis Testing

	Moderator	Mode	Indirect Effect	Direct effect	Boot%	Results
			β (SE)	β (SE)	[LLCI,ULCI]	
EE → DEI				0.33(0.03)	[0.27,0.39]	H1 supported
EE→DESE				0.5567(0.02)	[0.51,0.61]	H2 supported
DESE→DEI				0.7132(0.05)	[0.61,0.81]	H3 supported
EE→DESE→ DEI		Low	0.31(0.04)		[0.24,0.39]	H4 supported
		Medium	0.32(0.03)		[0.27,0.38]	
		High	0.33(0.04)		[0.26,0.40]	
EE→DL→DEI	DL			0.05(0.01)	[0.02,0.08]	H5 supported

Chapter 5

Discussion

The results obtained from the quantitative analysis provide valuable insights into the relationships among EE, DEI, DESE, and DL. This discussion chapter aims to interpret and discuss the key findings, their implications, and potential contributions to the existing literature.

This implies that the variables collectively contribute to the underlying constructs being investigated. The correlation analysis reveals significant positive relationships among all the

variables. EE exhibits a strong positive correlation with DEI. DESE also demonstrates strong positive correlations with EE and DEI. DL positively correlates with all three constructs. These findings align with theoretical expectations and support the conceptual framework of the study. The factor analysis elucidates the cumulative variance explained by the model. The cumulative percentage of 28.639% suggests that the model adequately captures the relationships among the variables. While this percentage might seem modest, it is within an acceptable range for exploratory factor analysis. The Confirmatory Factor Analysis (CFA) results illustrated validated the measurement model's construct validity. The loadings, Average Variance Extracted (AVE), and Composite Reliability (CR) values for each construct meet the criteria for convergent validity and reliability. The fit indices, including CMIN / Df, RMSEA, CFI, and SRMR, further support the model's goodness of fit. This confirms the suitability of the chosen measurement model.

The Process Macro analysis which was performed proved the hypothesis introduced in the study. The first hypothesis (H1) stated that there is a positive relationship between EE and DEI. The process macro analysis confirmed this hypothesis proving that the graduates who had relatively high level of EE gained through courses in their graduate studies had higher levels of DEI. It aligned with a few studies conducted in different countries which EE led to increase in DEI. One of the problem identified was the lack of studies conducted which research the impact of EE on DEI. This hypothesis answered a main research question which was to investigate the relationship between EE and DEI. Most of the studies only remained focused on the traditional entrepreneurship intentions causing a severe lack of research on digital entrepreneurial intentions. The results of this study contribute to the literature by proving the positive relationship between EE and DEI. These results can provide the policymakers and stakeholders a guideline to include more entrepreneurship based courses as they can further increase DE within the country.

The second hypothesis (H2) stated that EE is positively related to DESE. The process macro analysis confirmed this hypothesis by proving that the positive relationship between the variables. It was confirmed that as the level of EE studied in university can result to increase in the level of DESE of the graduates. This result made a significant contribution in the existing literature as there are very few studies which analyzed DESE variable and there was no study conducted on the relationship between EE and DEI. This hypothesis makes an important conclusion which the education stakeholders can use to further increase the DESE among the graduates by offering

diverse range of entrepreneurship courses among the university programs provided to the engineering students.

The third hypothesis (H3) included in the research was that DESE is positively related to DEI. The results indicated by process macro proved this hypothesis stating that as the DESE increases, the DEI also increases. As the positive relationship is proved the two variables, this can contribute towards the existing literature where this relationship has not been studied before. It can add towards the literature of DEI and the factors which affect it positively. It can help the stakeholders to further make policies which can increase DE within Pakistan.

The fifth hypothesis (H5) explored that the DL moderates the relationship between EE and DEI. The hypothesis was confirmed by the process macro analysis proving that DL positively moderates the relationship of EE and DEI. It was analyzed that as the DL of the graduates increases i.e they had more DL, the more positive relationship was found between the EE and DE intention. This proves to be a very beneficial addition towards the literature as previously the role of DL was not studied in the relationship between EE and DE intention. This hypothesis also answered the research question which investigated what moderating role does DL has on the relationship between EE and DEI.

The fourth hypothesis (H4) stated that digital entrepreneurial self-efficacy mediates the interactive effect of entrepreneurship education and digital entrepreneurship intentions. The results of the hypothesis testing provide substantial evidence supporting the mediating role of digital entrepreneurial self-efficacy in the relationship between entrepreneurship education and digital entrepreneurship intentions. The introduction of digital entrepreneurial self-efficacy as a mediator unveils the intricate processes through which entrepreneurship education influences these intentions. Digital entrepreneurial self-efficacy acts as a crucial intermediary, enhancing the positive impact of entrepreneurship education on fostering digital entrepreneurial intentions. This mediation effect highlights the nuanced pathways through which individuals, equipped with entrepreneurial education, navigate and shape their intentions in the digital landscape. The confirmation of this hypothesis not only reinforces the significance of digital entrepreneurial self-efficacy but also emphasizes its pivotal role in translating educational experiences into tangible digital entrepreneurial intentions. As a result, the study provides valuable insights into the interconnected dynamics of entrepreneurship education, digital entrepreneurial self-efficacy, and digital entrepreneurship intentions, contributing to a more comprehensive understanding of these relationships in the contemporary digital era.

The current research findings resonate with and significantly contribute to the existing literature on entrepreneurship education, digital entrepreneurship, and related constructs. The positive relationships observed between entrepreneurship education and digital entrepreneurship intentions align with prior studies emphasizing the transformative role of education in shaping entrepreneurial attitudes and intentions (Krueger, Reilly, & Carsrud, 2000; Liñán & Chen, 2009). The study reinforces the established notion that education acts as a catalyst, equipping individuals with the knowledge and skills necessary for entrepreneurial pursuits (Fayolle & Gailly, 2008). Moreover, the mediation effect of digital entrepreneurial self-efficacy is consistent with Bandura's social cognitive theory, which posits that individuals' beliefs in their capabilities influence their behaviors and aspirations (Bandura, 1986). This finding underscores the importance of cultivating not only entrepreneurial knowledge but also in addition the confidence and self-efficacy necessary for individuals to translate their education into the entrepreneurial intentions (Chen et al., 1998; Zhao, Seibert, & Lumpkin, 2010). The moderating role of digital literacy aligns with the evolving landscape of the entrepreneurship in the digital age. Contemporary entrepreneurial endeavors are increasingly reliant on the digital technologies and individuals with higher levels of digital literacy are better positioned to leverage these tools for innovation and business development (Hatak et al., 2018).

This finding is consistent with previous research highlighting the crucial role of digital skills in entrepreneurial success and the ability to navigate the challenges of the digital business environment (Srinivasan & Venkatraman, 2018). The study augments existing knowledge by providing the empirical evidence that bridges the gap between EE, DL and the digital entrepreneurial intentions. It enriches the literature by offering a comprehensive understanding of the interconnectedness among these factors in shaping individuals' digital entrepreneurial aspirations.

Chapter 6

Conclusion

6.1 Conclusion

To conclude this thorough thesis, the research has delved into the intricate relationships between EE, DEI, DESE, and DL. The empirical investigation done on this research is driven by a quantitative analysis approach which has yielded profound insights into the dynamics. This is shaping the aspirations of the individuals in the digital entrepreneurial landscape. The investigation in this research began with a presentation of descriptive statistics. It provided a picture of the participants' perceptions and further it went on and laid the groundwork for a thorough analysis. The reliability analysis which was performed also demonstrated the research instrument's internal consistency which further went on encouraging confidence in the collected data. Subsequent statistical tests such as Kaiser-Meyer-Olkin (KMO) and Bartlett's Test also paved the way for a robust factor analysis. It exposed the underlying components that contributed to the overall framework. Correlation analysis revealed substantial positive connections between the variables which was shown to be supporting theoretical expectations. Factor analysis explained a total variation of 28.639 percent. It offered a more detailed view of the model's ability to capture the complexities of the studied relationships. Confirmatory Factor Analysis (CFA) validated the construct validity of the measurement model. Along with the fit indices attesting to its appropriateness. Process macro analysis also corroborated with the hypotheses. It was affirming positive direct effects and unveiling substantial mediation and moderation effects.

The fulfillment of the research objectives and questions is evident in the study's outcomes. Firstly, the research objective aimed at determining the nature of the relationship between EE and DEI is achieved through robust empirical evidence showcasing a positive association between these two variables. This directly corresponds to the first research question, which sought to understand the relationship between EE and DEI. Secondly, the research objective involving the investigation of the moderating effect of DL on the relationship between EE and DEI is met through the process macro analysis. The research successfully answers the third research question by highlighting the positive moderating role that DL plays in enhancing the relationship between EE and DEI. Lastly, the examination of whether DESE acts as a mediating factor in the interactive relationship between

EE and DEI, as per the second research question, is conclusively addressed. The study provides empirical support for the mediating role of DESE, uncovering the intricate processes through which EE influences DEI. This aligns with the research objective focusing on the mediating effect of DESE.

The study adds significantly to the current literature by focusing on digital entrepreneurial intentions and sheds insight on the long-term impact of EE in influencing intentions in the DE. The theoretical implications enrich established frameworks, emphasizing the interconnected factors influencing digital entrepreneurial intentions. Practically, the findings guide educational institutions, policymakers, and practitioners in crafting tailored programs that align with the demands of the digital landscape. The positive association between EE and DESE underscores the need for practical experiences, while the moderation effect of DL underscores its critical role in shaping the effectiveness of EE initiatives. As the entrepreneurial landscape continues to evolve, this thesis serves as a foundational contribution to the understanding of DE aspirations. While the study provides valuable insights, it is not without limitations, such as the cross-sectional nature of the data and the focus on a specific demographic. Future research endeavors may benefit from longitudinal designs and the exploration of diverse populations for enhanced generalizability. Additionally, a more granular investigation into specific dimensions of DL could offer deeper insights into its role in the entrepreneurial landscape.

In conclusion, this thesis advances scholarly understanding and practical implications in the realm of EE and DE. As we stand at the intersection of education and the digital age, the knowledge gleaned from this research becomes a compass guiding future endeavors to foster a generation of entrepreneurs equipped to navigate and thrive in the ever-evolving entrepreneurial ecosystem.

6.2 Theoretical Implications of the Study

The findings of this study hold several theoretical implications that contribute to the broader understanding of the interplay between EE, DESE, DL, and intentions toward DE. Previous studies within the domain of EE and SE often focused on generic entrepreneurial intentions, neglecting the distinct realm of DEI. This study bridges this gap by specifically examining the impact of EE on intentions toward DE in Pakistan. By incorporating DEI into the theoretical framework, the study advances the understanding of how entrepreneurial education influences individuals' aspirations and inclinations within the digital landscape within Pakistan. The omission of this

dimension in prior research limited the comprehensive understanding of the nuanced effects of EE in the contemporary context. Firstly, the study establishes the enduring influence of EE on shaping individuals' DEI among the graduates of Pakistan. This underscores the theoretical importance of educational interventions in fostering a mindset conducive to engaging in digital entrepreneurial activities. The study aligns with existing literature emphasizing the positive impact of educational experiences on entrepreneurial intentions (Fayolle & Gailly, 2015).

Fourthly, the confirmation of DESE as a mediator between EE and DEI contributes a valuable mechanism to the theoretical framework. This mediation process aligns with Bandura's theory, providing insights into how educational experiences impact intentions through the enhancement of self-efficacy beliefs in the digital entrepreneurial domain. Lastly, the study introduces a novel theoretical perspective by revealing the moderating role of DL in the relationship between EE and DEI. This finding suggests that the effectiveness of EE in influencing digital entrepreneurial intentions is contingent upon individuals' DL levels. The study adds to the evolving literature emphasizing the importance of technological proficiency in contemporary entrepreneurial landscapes.

The theoretical implications of this study enrich the existing theoretical frameworks by shedding light on the intricate connections among EE, DESE, DL, and intentions toward DE. These findings contribute to the advancement of theoretical perspectives in the field of EE and DE, providing a nuanced understanding of the factors shaping individuals' intentions in the digital era.

6.3 Practical Implications of the Study

The findings of this study carry significant practical implications for educators, policymakers, and practitioners involved in EE and the promotion of DE. The positive relationship identified between EE and DEI underscores the importance of tailored educational programs. Educators and curriculum designers can use this insight to customize EE courses. It ensures they incorporate elements specifically relevant to DE. By doing this the educational institutions can better equip aspiring entrepreneurs with the skills and mindset necessary for success in the digital landscape (Lorz, Müller, & Volery, 2013).

The positive association between EE and DESE implies pursuits. Educational institutions, training organizations, and online platforms can focus on that educational interventions can contribute to boosting individuals' confidence in digital entrepreneurial. Which is further used for fostering

digital self-efficacy through practical, hands-on experiences and exposure to real-world digital business scenarios (Chen, Kirkman, Kanfer, Allen, & Rosen, 2007). The moderation effect of DL adds another layer of practical implications, emphasizing the necessity for considering technological proficiency when designing and implementing EE initiatives. Policymakers and educational leaders should recognize the critical role of DL in shaping the effectiveness of EE. Initiatives that promote and enhance DL can complement EE efforts, ensuring that individuals are not only educated in entrepreneurial principles but are also adept in leveraging digital tools and technologies (Venkatesh, Thong, & Xu, 2012).

The practical implications suggest a need for a holistic approach in EE, one that goes beyond imparting theoretical knowledge to encompass tailored content, hands-on experiences, and a strategic integration of DL. These practical insights can guide the development of effective educational programs and policies that align with the demands of the contemporary digital business landscape, fostering a generation of entrepreneurs equipped to thrive in the evolving entrepreneurial ecosystem.

6.2 Limitations and Future Research Directions

While the study provides valuable insights as it is essential to acknowledge its limitations. First if we see the data collected for this research relies on self-reported measures. Which may introduce common method bias and social desirability bias. Future research could employ multi-source data collection methods to mitigate these biases and enhance the validity of the findings. Secondly the study's cross-sectional design limits the establishment of causality. Longitudinal studies could offer a more robust understanding of the dynamic relationships between EE, DESE, DL, and DEI over time. Third if we see the sample predominantly consists of individuals from a specific demographic or educational background. The generalizability of the findings to a broader population or different cultural contexts may be limited. Future research should strive for more diverse and representative samples to enhance external validity.

In conclusion by addressing these limitations and pursuing the outlined future research directions can contribute to the advancement of knowledge in the field of EE and DE. It can ensuring a more comprehensive and nuanced understanding of the complex interplay between education, self-efficacy, literacy, and intentions in the digital realm.

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Appendix

Entrepreneurship Education

- The Entrepreneurship course enables me to identify the characteristics of successful digital entrepreneurs (e.g. risk-taking, proactivity, innovativeness).
- Entrepreneurship education gives me a feeling of independence.
- Entrepreneurship education increases my awareness of the different forms of digital businesses that I can set up (i.e. Sole proprietorship, partnership).
- I have acquired the skills, knowledge, and competencies needed to establish, develop, and manage a new digital business from the entrepreneurship course.
- Entrepreneurial training increases my awareness of the duties and rights of digital entrepreneurs and their commitment to their stakeholders.
- The entrepreneurship course has enhanced my understanding of the different sources I can obtain funding to start a new digital business increases

Digital Entrepreneurship Intentions

- I am ready to do anything to be a digital entrepreneur
- I will make every effort to start and run my own digital business
- I have serious doubts about ever starting my own digital business
- I am determined to create a digital business venture in the future
- My professional goal is to be a digital entrepreneur
- I have a very low intention of ever starting a digital business

Digital Entrepreneurial Self-Efficacy

- I have confidence that I can realize a digital business
- I have the ability to take advantage of digital business opportunities
- I have ability in digital business management and application
- I have ability develop and commercializing new digital ideas
- I have the ability to build good relationships with business partners

Digital Literacy

- I can look for data/information through digital platform
- I can share knowledge and/or information through digital platform
- I can store, manage, and disseminate knowledge and/or information through digital platform
- I can use the knowledge/information from digital platform to enrich, apply, combine, design the existing
- I know how to search and download useful information online for my purpose
- Online digital facilities provide new knowledge for me