“Effect of digital opportunity recognition on students’ digital entrepreneurial intentions and behavior”

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ARTICLE INFO	Sura Al-Ayed (2024). Effect of digital opportunity recognition on students’ digital entrepreneurial intentions and behavior. *Problems and Perspectives in Management*, *22*(1), 673-686. doi:10.21511/ppm.22(1).2024.53
DOI	http://dx.doi.org/10.21511/ppm.22(1).2024.53
RELEASED ON	Wednesday, 27 March 2024
RECEIVED ON	Thursday, 25 January 2024
ACCEPTED ON	Monday, 18 March 2024

JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
61	4	7

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

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EFFECT OF DIGITAL OPPORTUNITY RECOGNITION ON STUDENTS' DIGITAL ENTREPRENEURIAL INTENTIONS AND BEHAVIOR

Abstract

This study aims to examine the effect of digital opportunity recognition on students' intentions and behavior related to digital entrepreneurship. The study measures the influence of digital opportunity recognition on antecedents of the theory of planned behavior and indirect influence on digital entrepreneurial intentions and behavior. This study employed a cross-sectional design. Data were collected from 2,840 students enrolled in professional management and entrepreneurship directions at universities in Saudi Arabia. The target sample consisted of individuals who have plans to become entrepreneurs. The findings indicated that digital opportunity recognition has a direct and significant effect on attitude, subjective norms, perceived self-efficacy, and an indirect effect on intentions and behavior toward digital entrepreneurship. Furthermore, this study checked multigroup differences between male and female samples: males show more favorable behavior toward digital entrepreneurship compared to females in Saudi Arabia. Collectively, the antecedents of the theory of planned behavior and digital opportunity recognition explained 65.1% of the variance in digital entrepreneurial behavior, with males at 68.2% and females at 63.2%. The research implication is that policymakers should prioritize integrating digital entrepreneurship into education curricula and providing support mechanisms to nurture the potential of digital-native students.

Keywords digital entrepreneurship, intention, behavior, Saudi Arabia

JEL Classification M10, M13, L26, M20

Received on: 25th of January, 2024
Accepted on: 18th of March, 2024
Published on: 27th of March, 2024

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Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

Digitization has fundamentally reshaped the world, ushering in the digital economy, which is considered the second most significant economic advancement after the Industrial Revolution (Kraus et al., 2019; Tandon et al., 2020). The adoption of digital technology serves as a crucial driver of entrepreneurship (Hejazinia, 2015), offering entrepreneurs abundant opportunities for business growth and expansion (R. Tajvidi & M. Tajvidi, 2021). The internet and technology have revolutionized business startup processes, giving rise to a new entrepreneurial paradigm termed "digital entrepreneurship" (Nambisan et al., 2019; Alkhalaileh, 2021; Al-Ayed, 2024). This connection between entrepreneurship and the internet is expressed through various terms, such as electronic entrepreneurship, digital entrepreneurship, and internet entrepreneurship (Wang et al., 2016). There are relatively few studies on digital entrepreneurship and its intentions and behavior influenced by digital opportunity recognition. The limited literature on the subject of emerging digital entrepreneurship, especially digital opportunity recognition, made it evident that further research and knowledge are needed (Badaruddin & Abdullah, 2018; Al-Ayed & Al-Tit, 2024).

According to Hull et al. (2007), digital entrepreneurship falls under the umbrella of traditional entrepreneurship, involving the digitization of physical aspects of a typical business. The field of digital entrepreneurship is gaining recognition as a prospective career path. In the specific context of the Kingdom of Saudi Arabia, structural reforms have been implemented to foster economic growth, stability, and long-term sustainability. This is seen in Saudi Arabia's improving business climate and continued efforts to empower the business sectors to support the economy and remove obstacles to make it more desirable to engage in previously underutilized industries (Saudi Arabia Vision 2030). To encourage young investors and entrepreneurs, Saudi Arabian leadership is acting fast to change laws and regulations, remove obstacles, and expand access to finance resources (Al-Mamary & Alshallaqi, 2022). In this regard, the Saudi Arabian government established the "Monsha'at" as a single entity to foster the spirit of entrepreneurship and support small and medium-sized ventures. However, the nascent entrepreneur skills toward digital opportunity recognition are in their infancy.

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Digital entrepreneurship encompasses seizing emerging business opportunities facilitated by advancements in technology (Davidson & Vaast, 2010). According to Younis et al. (2020), it involves creating unique value through digital product utilization. This includes leveraging mobile technology, cloud computing, and social media, as outlined by the European Commission's Digital Entrepreneurship Monitor (2012). Foundational aspects, such as idea generation and marketing, are shared with traditional entrepreneurship, but digital entrepreneurship integrates technology across the venture's value chain (Ngoasong, 2018; Alkhalaileh, 2021). Dy (2022) categorizes digital entrepreneurship into three groups: basic e-commerce websites, cloud computing, and intricate multimedia platforms.

According to the theory of planned behavior (TPB), which is a cognitive model, behavior is influenced by an individual's decision-making, planning, and management, and it can lead to foreseeable outcomes (Ajzen, 1991). This theory is used in various studies on entrepreneurship, including those by Shah and Soomro (2017), Nasar et al. (2019), and Nasar and Akram (2022). Attitude refers to the degree of favorability or unfavorability toward a problem or behavior. Subjective norms pertain to the influence exerted by significant individuals, such as friends, relatives, family, and coworkers, on whether or not to perform a specific behavior. Perceived behavioral control refers to the perceived simplicity or complexity of a particular behavior. The TPB has been extensively used in empirical research to assess people's intentions and behaviors related to starting new businesses, as demonstrated by Gieure et al. (2020), Nasar et al. (2019), and Abbasianchavari and Moritz (2021).

The recognition of opportunities has long been considered a vital step in terms of business setup (Ozgen & Baron, 2007). Many scholars viewed it as a critical step that often leads to subsequent stages in establishing new ventures. Previous research has explored opportunity recognition from various perspectives. For example, several studies have emphasized the importance of actively searching for opportunities and the factors that influence such efforts (Kirzner, 1979, 1997; Gaglio & Katz, 2001). However, other studies have focused on the opportunities that arise from dynamic interactions between technical, political, and economic factors (Shane, 2003). Consequently, the recognition of opportunities may vary depending on the entrepreneur's characteristics. These details are crucial for both the initial identification of opportunities and the subsequent feasibility assessments that entrepreneurs undertake to determine whether they have identified a viable opportunity to launch a successful new business (Ardichvili et al., 2003). Similarly, Sarasvathy et al. (1998) observed that certain individuals discover opportunities because they absorb and process information in unique ways, potentially more effectively than others. According to Baron (2004), opportunity

http://dx.doi.org/10.21511/ppm.22(1).2024.53

recognition may also rely on cognitive structures possessed by certain individuals, such as frameworks for organizing and interpreting information based on life experiences. In the digital era, access to information is readily available through digital sources like websites and social media platforms. While information can originate from various sources, this study specifically focuses on digital sources of opportunity-related information. The level to which an individual perceives the establishment of a new company as favorable or unfavorable is known as a personal attitude. If this attitude is strongly positive, it will lead to a greater intention to become an entrepreneur (Liñán et al., 2020). Alferaih (2017) conducted a comprehensive analysis to check the relationship between these factors and found significant results in 65 out of 70 instances within the entrepreneurial literature.

Subjective norms pertain to an individual's perception of favorable opinions held by significant individuals such as family, friends, and coworkers regarding their decision to initiate a business venture (Gieure et al., 2019). The existence of these positive expectations plays a role in fostering plans for starting a company and entrepreneurial aspirations (Schlaegel & Koenig, 2014). While subjective norms can be weak predictors (Iakovleva et al., 2011), they can strongly influence entrepreneurial intention (Siu & Lo, 2013). This study argues that the intentions of university graduates to establish a business will be influenced by subjective norms. In Saudi Arabian culture, individuals are expected to comply and fulfill the needs of their families, extended families, and broader social ties due to the collectivist nature of the country (Hofstede, 1984).

Perceived self-efficacy in entrepreneurship relates to an individual's belief in his/her capability to successfully perform entrepreneurial tasks and overcome challenges within the entrepreneurial context. Self-efficacy denotes one's confidence in one's ability to effectively accomplish a task (Wood & Bandura, 1989). This motivating factor significantly influences both intention and behavior. Consequently, it affects how individuals initiate behavior, including the level of effort they exert and their persistence in the face of challenging circumstances (Bandura, 1977). Extensive evidence has demonstrated that entrepreneurial self-efficacy serves as a crucial precursor to entrepreneurial intention and behavior (Morton et al., 2014; Lee et al., 2011). The level of time, financial resources, and effort a student invests in starting a business is influenced by perceived capacity.

The ambition to launch a business at some point in the future is referred to as entrepreneurial intention (Thompson, 2009). Entrepreneurial intention and behavior have a substantial association (Nasar et al., 2019; Sharahiley, 2020). Accordingly, university graduates' effort, preparation, and resolve to become prosperous digital entrepreneurs in the future influence their effort, time commitment, and dedication to setting up businesses.

The study aims to investigate the effect of digital opportunity recognition on intention and behavior related to digital entrepreneurship. The paper measured the direct impact of digital opportunity recognition on the antecedents of TPB (attitude, subjective norms, and perceived self-efficacy) and the indirect impact on digital entrepreneurial intention and behavior. The hypotheses are as follows (Figure 1).

Direct Effects:

H1: Digital opportunity recognition affects attitude.

H2: Digital opportunity recognition affects subjective norms.

H3: Digital opportunity recognition affects perceived self-efficacy.

H4: Attitude affects digital entrepreneurial intention.

H5: Subjective norms affect digital entrepreneurial intention.

H6: Perceived self-efficacy affects digital entrepreneurial intention.

H7: Perceived self-efficacy affects digital entrepreneurial behavior.

H8: Digital entrepreneurial intention affects digital entrepreneurial behavior.

H9: There is a difference between males and females in terms of their attitude, subjective norms, perceived self-efficacy and intention when intermediate between digital opportunity recognition and digital entrepreneurship behavior.

The hypotheses for indirect effects (mediation) for males are:

H10: Attitude mediates the relation between digital opportunity recognition and digital entrepreneurial intention for males.

H11: Perceived self-efficacy mediates the relation between digital opportunity recognition and digital entrepreneurial behavior for males.

H12: Perceived self-efficacy and digital entrepreneurial intention mediate the relation between digital opportunity recognition and digital entrepreneurial behavior for males.

H13: Digital entrepreneurial intention mediates the relation between subjective norms and digital entrepreneurial behavior for males.

H14: Digital entrepreneurial intention mediates the relation between attitude and digital entrepreneurial behavior for males.

H15: Digital entrepreneurial intention mediates the relation between perceived self-efficacy and digital entrepreneurial behavior for males.

H16: Attitude and digital entrepreneurial intention mediate the relation between digital opportunity recognition and digital entrepreneurial behavior for males.

H17: Subjective norms mediate the relation between digital opportunity recognition and digital entrepreneurial intention for males.

H18: Perceived self-efficacy mediates the relation between digital opportunity recognition and digital entrepreneurial intention for males.

H19: Subjective norms and digital entrepreneurial intention mediate the relation between digital opportunity recognition and digital entrepreneurial behavior for males.

The hypotheses for indirect effects (mediation) for females are:

H20: Attitude mediates the relation between digital opportunity recognition and digital entrepreneurial intention for females.

H21: Perceived self-efficacy mediates the relation between digital opportunity recognition and digital entrepreneurial behavior for females.

H22: Perceived self-efficacy and digital entrepreneurial intention mediate the relation between digital opportunity recognition and digital entrepreneurial behavior for females.

H23: Digital entrepreneurial intention mediates the relation between subjective norms and digital entrepreneurial behavior for females.

H24: Digital entrepreneurial intention mediates the relation between attitude and digital entrepreneurial behavior for females.

H25: Digital entrepreneurial intention mediates the relation between perceived self-efficacy and digital entrepreneurial behavior for females.

H26: Attitude and digital entrepreneurial intention mediate the relation between digital opportunity recognition and digital entrepreneurial behavior for females.

H27: Subjective norms mediate the relation between digital opportunity recognition and digital entrepreneurial intention for females.

H28: Perceived self-efficacy mediates the relation between digital opportunity recognition and digital entrepreneurial intention for females.

H29: Subjective norms and digital entrepreneurial intention mediate the relation between digital opportunity recognition and digital entrepreneurial behavior for females.

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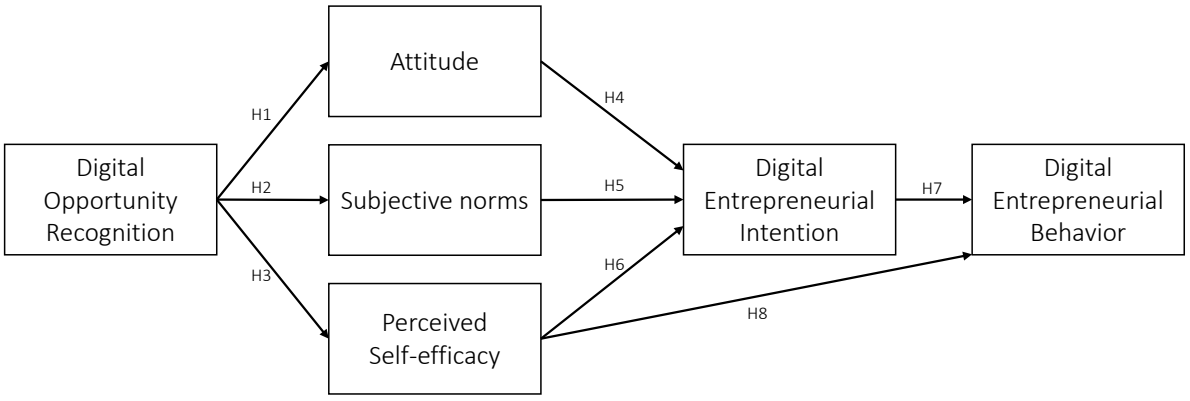

Figure 1. Research model

2. METHODOLOGY

Using a questionnaire with 28 items covering seven constructs on a five-point Likert scale, survey data were gathered from a varied group of students enrolled in professional management and entrepreneurship courses at universities in Saudi Arabia. Eyal et al. (2009) showed a beneficial impact of business and entrepreneurial education on intention. The sample's inclusion of university students offers a solid foundation for evaluating the model and generalizability of findings. Utilizing the previously employed and validated items for all the constructs, data were gathered from January to February 2023. To help with a better comprehension of the subjects, the items included in the final questionnaire were translated into the participants' native language, which is Arabic. Experts did both forward and backward translations to confirm the test questionnaire's consistency (Gielnik et al., 2014). However, a pre-investigation test was carried out to confirm the reliability by examining the replies from a sample of 30 students. Therefore, some of the items were simplified and removed from the survey. The study utilized the published questionnaire to check the validity of the items. The targeted sample was given access to the online questionnaire using convenience sampling. The study successfully gathered 2,840 online questionnaires, of which the number of male students from Saudi Arabian universities was 1,134 (40%) and 1,706 were female students (60%); 395 (13.9%) were 16-18 years old, 833 (29.33%) were 19-20 years old, 831 (29.26%) were 21-22 years old, 491 (17.28%) were 23-24 years old, and 290 (10.21%) were above 25.

The initial section of the survey outlined the objectives of the study and provided guidelines for completing the surveys. In the subsequent section, participants were requested to provide personal information. The third section employed a Likert scale ranging from one to five (one shows "strongly disagree" and five shows "strongly agree") to assess the main research questions. To measure digital entrepreneurship intention, three questions were adapted from Sobaih and Elshaer (2022), with slight modifications to suit the research context. The scale items demonstrated strong internal consistency reliability ($\alpha = 0.775$). Attitude toward establishing a digital business was assessed using four items from Ajzen's TPB and administered to university students (Ajzen, 2011). The attitude items exhibited satisfactory Cronbach's alpha reliability ($\alpha = 0.733$). Subjective norms were evaluated using three items adapted from Liñán and Chen (2009), displaying a strong reliability score ($\alpha = 0.822$). Perceived self-efficacy was measured using six items from Liñán and Chen (2009), indicating a strong reliability score ($\alpha = 0.867$). Digital entrepreneurial behavior was measured with seven items adapted from Gieure et al. (2020), demonstrating a strong reliability score ($\alpha = 0.890$). Digital opportunity recognition was measured using five items from Ozgen and Baron (2007), displaying good reliability ($\alpha = 0.786$). Table 1 shows details regarding each construct and its associated items.

The survey data underwent analysis utilizing the partial least squares structural equation modeling (PLS-SEM) technique with SmartPLS 4. PLS-SEM is widely embraced in management and information technology fields due to its track record

of generating reliable results (Avkiran & Ringle, 2018). It enables the examination of both direct and indirect effects of latent variables comprehensively, encompassing strong and weak path coefficients in complex models (Hoyle, 1999; Heuer & Liñán, 2013). The initial step involved testing the outer model for discriminant and convergent validity based on the proposed theoretical model. Following this, the inner model was assessed to evaluate the hypotheses.

3. RESULTS

The study utilized a variety of statistical measures, as advocated by Hair et al. (2019), to evaluate the validity and reliability of the outer models. These measures comprised factor loadings surpassing 0.7, composite reliability exceeding 0.7, internal consistency reliability (Cronbach's alpha) greater than 0.7, and convergent validity demonstrated by an average variance extracted surpassing 0.5.

Table 1. Measurement model

No.	Constructs and items	Loadings	Cronbach's Alpha	Composite reliability	Average variance extracted
	Digital opportunity recognition		**0.786**	**0.854**	**0.539**
1	"I see many opportunities to start and grow a digital business"	0.700			
2	"Finding potential digital venture opportunities is easy for me"	0.748			
3	"In general, there are many digital opportunities for new product innovation"	0.746			
4	"I have a special sense of new digital venture ideas"	0.727			
5	"During my routine day-to-day activities, I see potential new digital venture ideas"	0.748			
	Attitude		**0.733**	**0.833**	**0.556**
6	"I think that digital businesses are meaningful"	0.724			
7	"I think that digital businesses are enjoyable"	0.780			
8	"I think that digital businesses are novel"	0.674			
9	"I think that digital businesses are an intelligent choice"	0.797			
	Subjective norms		**0.822**	**0.894**	**0.738**
10	"If you decided to create a digital business, would your close family in your close environment approve of that decision?"	0.842			
11	"If you decided to create a digital business, would your friends in your close environment approve of that decision?"	0.863			
12	"If you decided to create a digital business, would your colleagues in your close environment approve of that decision?"	0.872			
	Perceived self-efficacy		**0.867**	**0.901**	**0.602**
13	"I can control the creation process of a new digital business"	0.734			
14	"If I tried to start a digital business, I would have a high probability of success"	0.726			
15	"Starting a digital business and keeping it functional would be easy for me"	0.793			
16	"I know the necessary practical details to start a digital business"	0.788			
17	"I am prepared to start a viable digital business"	0.803			
18	"I know how to develop a digital entrepreneurial project"	0.807			
	Digital entrepreneurial intention		**0.775**	**0.870**	**0.691**
19	"I will recommend others to invest in digital businesses"	0.841			
20	"I will continue to invest in digital businesses"	0.864			
21	"I can stand the inconvenience caused by digital businesses"	0.786			
	Digital entrepreneurial behavior		**0.890**	**0.914**	**0.604**
22	"I have experience in starting new digital projects or businesses"	0.836			
23	"I am capable of developing a digital business plan"	0.836			
24	"I know how to start a new digital business"	0.852			
25	"I know how to do market research"	0.795			
26	"I have invested in an informal manner in some digital business"	0.710			
27	"I can save money to invest in a digital business"	0.700			
28	"I belong to a social network that can promote my digital business"	0.711			

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Table 2. Discriminant validity

Constructs	ATT	DEB	DEI	DOR	SEF	SN
Attitude (ATT)	0.745					
Digital entrepreneurial behavior (DEB)	0.353	0.777				
Digital entrepreneurial intention (DEI)	0.517	0.678	0.831			
Digital opportunity recognition (DOR)	0.588	0.577	0.594	0.734		
Perceived self-efficacy (SEF)	0.464	0.791	0.714	0.656	0.776	
Subjective norms (SN)	0.602	0.297	0.451	0.482	0.412	0.859

All these metrics, as depicted in Table 1, met the prescribed criteria. Discriminant validity was assessed utilizing the Fornell-Larcker criterion method, outlined in Table 2. To ensure discriminant validity, the emphasized outer loadings of each latent variable needed to exceed the cross-loadings with other constructs. These results collectively affirm the reliability of the scales. Notably, there was no indication of multicollinearity, as indicated by variance inflation factors below five.

The hypotheses were tested using structural equation modeling with SmartPLS 4. Once the measurement model was validated, PLS-SEM was employed to examine the hypothetical model within the structural model. The main objective was to evaluate the model's ability to explain and predict variations in the endogenous variables caused by the exogenous variable (Hult et al., 2018). The relationship was examined using *T*-statistics and bootstrapping with 5,000 sub-samples. The structural model provided detailed explanations of path coefficients and coefficients of determination (*R2*) separately for males and females (Figure 2, Figure 3, Figure 4, and Table 3). To ensure a good model fit, an *R2* value of at least 0.10, as recommended by Chin (1998), was considered (Table 6). Mediation analysis was conducted to identify indirect effects (Tables 4 and 5). Multigroup analysis (MGA) was also performed to assess statistically significant paths between male and female models and to examine variations in the factors between genders (Henseler & Chin, 2010), as presented in Table 7.

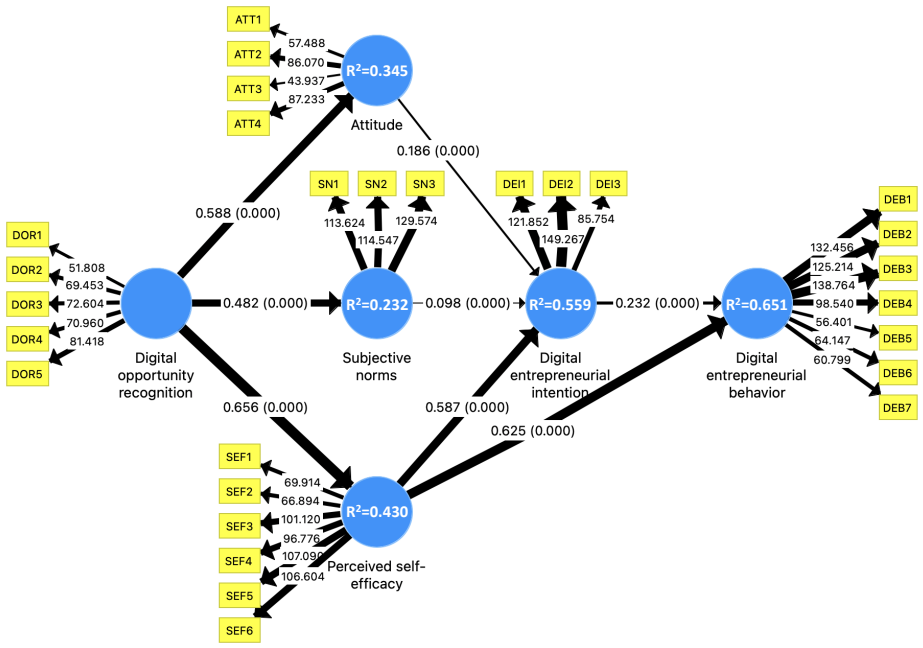
The research paper proposed twenty-nine hypotheses, including eight direct relationships, ten indirect relationships for males, ten for females, and one for multigroup differences between males and females. Based on the findings from SmartPLS (Table 3), the direct effects of digital opportunity recognition on attitude, subjective norms, and perceived self-efficacy were found to be positive and significant, supporting H1, H2, and H3. Furthermore, the antecedents of TPB (attitude, subjective norms, and perceived self-efficacy) exhibited a direct positive and significant influence on digital entrepreneurial intention, confirming H4, H5, and H6. Additionally, perceived self-efficacy and digital entrepreneurial intention positively and significantly influenced digital entrepreneurial behavior, validating H7 and H8. The multigroup analysis revealed significant differences between males and females in attitude toward digital entrepreneurial intention and perceived self-efficacy toward digital entrepreneurial behavior, partially supporting H9 (Table 7). The indirect mediation effects of attitude, subjective norms, perceived self-efficacy, and digital entrepreneurial intention between digital opportunity recognition and digital entrepreneurial behavior were found to

Table 3. Path coefficients (Direct effects)

Relationship	Full sample (n = 2,840)	Male (n = 1,134)	Female (n = 1,706)	Hypotheses	Results
DOR → ATT	0.588***	0.604***	0.578***	H1	Supported
DOR → SN	0.482***	0.459***	0.498***	H2	Supported
DOR → SEF	0.656***	0.675***	0.643***	H3	Supported
ATT → DEI	0.186***	0.239***	0.150***	H4	Supported
SN → DEI	0.098***	0.086**	0.106***	H5	Supported
SEF → DEI	0.587***	0.556***	0.607***	H6	Supported
DEI → DEB	0.232***	0.203***	0.254***	H7	Supported
SEF → DEB	0.625***	0.670***	0.592***	H8	Supported

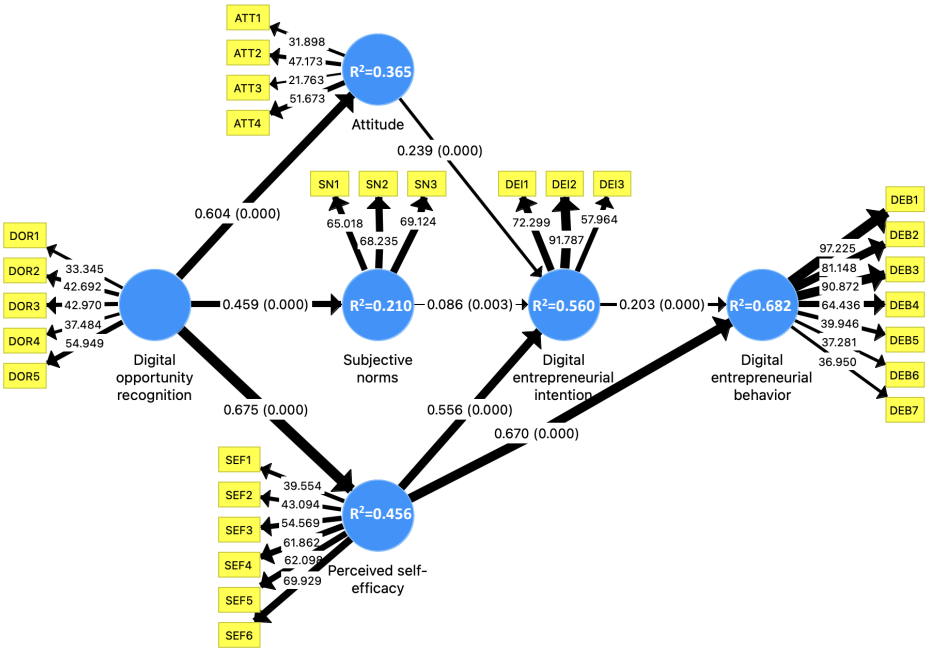
Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. ATT = Attitude; DEB = Digital Entrepreneurial Behavior; DEI = Digital Entrepreneurial Intention; DOR = Digital Opportunity Recognition; SEF = Perceived Self-efficacy; SN = Subjective Norms.

be positive and significant, accepting H10 to H19 for males (Table 4) and H20 to H29 for females (Table 5). For the entire sample, digital opportunity recognition accounted for 43.5%, 23.2%, and 43% of the variance in attitude, subjective norms, and perceived self-efficacy, respectively (Table 6). Collectively, the antecedents of TPB and digital opportunity recognition explained 65.1% of the variance in digital entrepreneurial behavior, with males at 68.2% and females at 63.2%.



Note: The study utilized relative values to emphasize the paths. Path coefficients are represented by arrow lines, with significant values indicated in brackets. *R*-squares are denoted by blue circles, and *t*-values are displayed for items associated with constructs. The results were obtained using SmartPLS 4.

Figure 2. Structural equation model for the full sample (n = 2,840)



Note: The study utilized relative values to emphasize the paths. Path coefficients are represented by arrow lines, with significant values indicated in brackets. *R*-squares are denoted by blue circles, and *t*-values are displayed for items associated with constructs. The results were obtained using SmartPLS 4.

Figure 3. Structural equation model for the male sample (n = 1,134)

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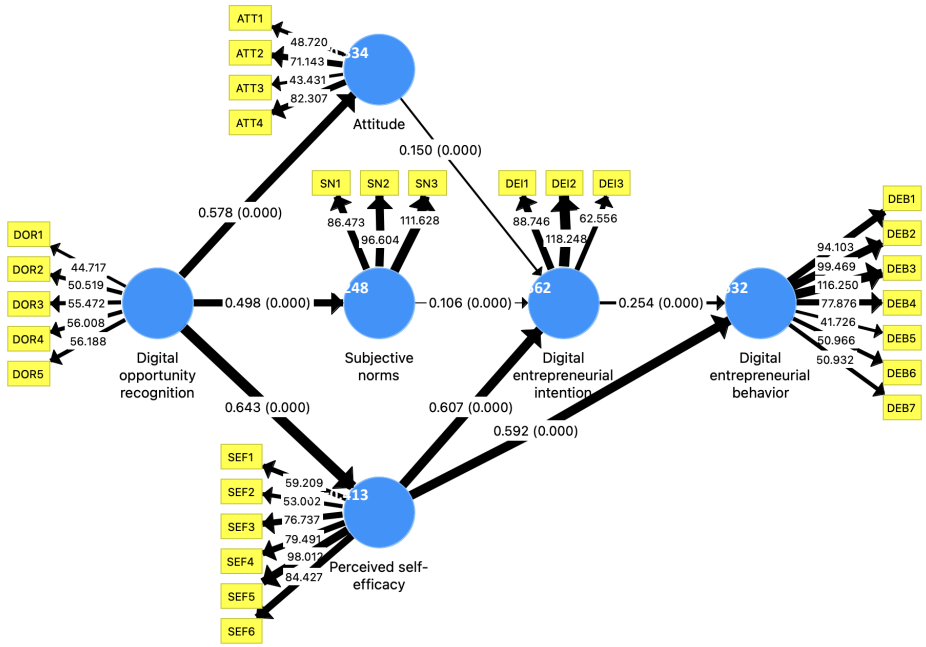

Note: The study utilized relative values to emphasize the paths. Path coefficients are represented by arrow lines, with significant values indicated in brackets. *R*-squares are denoted by blue circles, and *t*-values are displayed for items associated with constructs. The results were obtained using SmartPLS 4.

Figure 4. Structural equation model for the female sample (n = 1,706)

Table 4. Indirect effects (male sample, n = 1,134)

Relationship	Original Sample	P Values	Lower Threshold	Upper Threshold	Hypotheses	Results
DOR → ATT → DEI	0.144	0.000	0.106	0.186	H10	Supported
DOR → SEF → DEB	0.452	0.000	0.413	0.493	H11	Supported
DOR → SEF → DEI → DEB	0.076	0.000	0.055	0.097	H12	Supported
SN → DEI → DEB	0.017	0.004	0.006	0.029	H13	Supported
ATT → DEI → DEB	0.049	0.000	0.033	0.066	H14	Supported
SEF → DEI → DEB	0.113	0.000	0.083	0.143	H15	Supported
DOR → ATT → DEI → DEB	0.029	0.000	0.020	0.041	H16	Supported
DOR → SN → DEI	0.039	0.003	0.014	0.063	H17	Supported
DOR → SEF → DEI	0.376	0.000	0.339	0.415	H18	Supported
DOR → SN → DEI → DEB	0.008	0.005	0.003	0.014	H19	Supported

Note: ATT = Attitude; DEB = Digital Entrepreneurial Behavior; DEI = Digital Entrepreneurial Intention; DOR = Digital Opportunity Recognition; SEF = Perceived Self-efficacy; SN = Subjective Norms.

Table 5. Indirect effects (female sample, n = 1,706)

Relationship	Original Sample	P Values	Lower Threshold	Upper Threshold	Hypotheses	Results
DOR → ATT → DEI	0.087	0.000	0.059	0.117	H20	Supported
DOR → SEF → DEB	0.381	0.000	0.344	0.420	H21	Supported
DOR → SEF → DEI → DEB	0.099	0.000	0.077	0.121	H22	Supported
SN → DEI → DEB	0.027	0.000	0.014	0.039	H23	Supported
ATT → DEI → DEB	0.038	0.000	0.026	0.052	H24	Supported
SEF → DEI → DEB	0.154	0.000	0.121	0.186	H25	Supported
DOR → ATT → DEI → DEB	0.022	0.000	0.015	0.031	H26	Supported
DOR → SN → DEI	0.053	0.000	0.029	0.077	H27	Supported
DOR → SEF → DEI	0.391	0.000	0.360	0.424	H28	Supported
DOR → SN → DEI → DEB	0.013	0.000	0.007	0.020	H29	Supported

Note: ATT = Attitude; DEB = Digital Entrepreneurial Behavior; DEI = Digital Entrepreneurial Intention; DOR = Digital Opportunity Recognition; SEF = Perceived Self-efficacy; SN = Subjective Norms.

Table 6. Coefficient of determination

Relationship	Full sample (n = 2,840)		Male (n = 1,134)		Female (n = 1,706)	
	R Square	R Square Adjusted	R Square	R Square Adjusted	R Square	R Square Adjusted
Attitude (ATT)	0.345	0.345	0.365	0.365	0.334	0.333
Subjective norms (SN)	0.232	0.232	0.210	0.210	0.248	0.247
Perceived self-efficacy (SEF)	0.430	0.430	0.456	0.455	0.413	0.413
Digital entrepreneurial intention (DEI)	0.559	0.559	0.560	0.559	0.562	0.561
Digital entrepreneurial behavior (DEB)	0.651	0.651	0.682	0.681	0.632	0.631

Table 7. Multigroup analysis (MGA)

Relationship	Path Coefficients-diff (Male vs Female)	p-value (Male vs Female)
ATT → DEI	0.089	0.039*
DEI → DEB	−0.050	0.180
DOR → ATT	0.027	0.387
DOR → SEF	0.032	0.217
DOR → SN	−0.039	0.266
SEF → DEB	0.078	0.016*
SEF → DEI	−0.051	0.082
SN → DEI	−0.020	0.584

Note: * means significant differences. ATT = Attitude; DEB = Digital Entrepreneurial Behavior; DEI = Digital Entrepreneurial Intention; DOR = Digital Opportunity Recognition; SEF = Perceived Self-efficacy; SN = Subjective Norms.

4. DISCUSSION

This study investigated the direct effects of digital opportunity recognition on TPB dimensions among Saudi Arabian higher education students and the indirect effects on intentions and behaviors related to digital entrepreneurship. As hypothesized, both direct and indirect paths and impacts of the digital opportunity recognition on the antecedents of TPB were supported by the structural equation modeling findings using SmartPLS4 analysis since all of the paths were significant and positive, which confirmed hypotheses H1 to H29. These results coincide with Ozgen and Baron (2007) and Nasar et al. (2019). Furthermore, this study checked multigroup differences between male and female samples, indicating stronger behavior of males toward digital entrepreneurship than females in Saudi Arabia.

The findings offer several implications for academics, particularly concerning the recognition of digital opportunities and their associations with attitude, subjective norms, perceived self-efficacy, and digital entrepreneurial intentions and behavior. The study adds to the body of knowledge on digital opportunity recognition and its effects on digital entrepreneurship behavior among Saudi Arabian male and female higher education students. The paper has conclusively shown that the internet has aided in the growth of digital entrepreneurship (Nambisan et al., 2019). There are just a few articles on digital entrepreneurship and intention to engage in it (Alkhalaileh, 2021). Compared to traditional entrepreneurship, the purpose toward digital entrepreneurship has gotten less attention (Mir et al., 2023). The literature also provided inconsistent findings regarding the direct impact of digital opportunity recognition on TPB antecedents with little focus on digital entrepreneurship intention and behavior, which has not yet received adequate attention from researchers, particularly in Saudi Arabia. This study filled a substantial research gap and expanded the TBP hypothesis. The findings confirmed the indirect impact of digital opportunity recognition on digital entrepreneurship behavior for the first time.

The findings have a number of additional implications for policymakers, economists, and higher education educators. They suggest that more efforts are needed to promote digital opportunities for graduates because doing so will affect their attitudes, subjective norms, perceived self-efficacy, and ultimately, their intention and behavior to engage in digital entrepreneurship. The development of digital channels for emerging businesses should receive attention (Alateeg & Alhammadi, 2023). This might be accomplished by including a new chapter or section on digital startup potential for entrepreneurship in the Principles of entrepreneurship course, which was recently introduced to the curriculum for Saudi Arabian students enrolled in higher education. Higher education might benefit from more training and development initiatives to encourage a positive outlook, as this attitude has a significant

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impact on senior university students' intentions to pursue digital entrepreneurship. Therefore, investments should also be made in today's students, who are digital natives, and their attitudes toward the practical use of the internet and technology in the context of digital entrepreneurship (Al-Ayed et al., 2023). The design of thinking programs requires urgent attention. Working on the digital entrepreneurial ecosystem will let policymakers focus on interventions and the effective use of already available resources (Alateeg & Alhammadi, 2024; Alateeg et al., 2024). In order for potential new entrepreneurs to successfully operate their digital enterprises, institutions should provide students with loans, tax breaks, and reasonably priced leased workspaces. Furthermore, conducting longitudinal research to assess the influence of various factors on the model for entrepreneurial temporal intention and behavior is recommended.

CONCLUSION

This study examines how digital opportunity recognition among digital natives influences their intentions and behaviors concerning digital entrepreneurship. It assesses how recognizing digital opportunities affects key factors outlined in the theory of planned behavior – attitude, subjective norms, and perceived self-efficacy – and subsequently influences their intentions and behaviors in digital entrepreneurship. This study offers a fresh perspective on quantifying digital entrepreneurial intention and behavior influenced by digital opportunity recognition, thereby providing support for identifying nascent entrepreneurs in terms of thoughts and actions. The findings indicate that recognizing digital opportunities has a positive and significant impact on the antecedents of the theory of planned behavior. In Saudi Arabia, digital entrepreneurial intention and behavior are higher among males compared to females, suggesting that higher education students require a specific amount of time to develop their entrepreneurial goals, form intentions, secure resources, and shape their business ideas in the near future. This study suggests examining temporal entrepreneurial intention and behavior to define goals and targets for digital entrepreneurial activity and predict both immediate and distant future outcomes.

AUTHOR CONTRIBUTIONS

Conceptualization: Sura Al-Ayed.
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Formal analysis: Sura Al-Ayed.
Funding acquisition: Sura Al-Ayed.
Investigation: Sura Al-Ayed.
Methodology: Sura Al-Ayed.
Project administration: Sura Al-Ayed.
Resources: Sura Al-Ayed.
Software: Sura Al-Ayed.
Validation: Sura Al-Ayed.
Visualization: Sura Al-Ayed.
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Writing – review & editing: Sura Al-Ayed.

ACKNOWLEDGMENTS

The author extends his appreciation to the Arab Open University for funding this work through Research Fund No. (AOUKSA-524008).

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