“The influence of access to technology and digital literacy on female empowerment and digital entrepreneurial intentions”

AUTHORS

Ali Saleh Alshebami
Syed Ali Fazal
Abdullah M. Aljarodi
Nowshin Zarin
Abdullah Hamoud Ali Seraj
Elham Alzain

ARTICLE INFO

Ali Saleh Alshebami, Syed Ali Fazal, Abdullah M. Aljarodi, Nowshin Zarin, Abdullah Hamoud Ali Seraj and Elham Alzain (2025). The influence of access to technology and digital literacy on female empowerment and digital entrepreneurial intentions. *Problems and Perspectives in Management*, *23*(3), 1-12. doi:10.21511/ppm.23(3).2025.01

DOI http://dx.doi.org/10.21511/ppm.23(3).2025.01

RELEASED ON Tuesday, 01 July 2025

RECEIVED ON Sunday, 13 April 2025

ACCEPTED ON Friday, 20 June 2025

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
49

NUMBER OF FIGURES
1

NUMBER OF TABLES
3

BUSINESS PERSPECTIVES

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

www.businessperspectives.org

Ali Saleh Alshebami (Saudi Arabia), **Syed Ali Fazal** (Bangladesh),
Abdullah M. Aljarodi (Saudi Arabia), **Nowshin Zarin** (Bangladesh),
Abdullah Hamoud Ali Seraj (Saudi Arabia), **Elham Alzain** (Saudi Arabia)

THE INFLUENCE OF ACCESS TO TECHNOLOGY AND DIGITAL LITERACY ON FEMALE EMPOWERMENT AND DIGITAL ENTREPRENEURIAL INTENTIONS

Abstract

Women's empowerment is crucial for achieving Sustainable Development Goal 5, which seeks to eliminate all discrimination against women and promote effective female participation and equal opportunities. Education is one of the most powerful tools for empowering women. Therefore, this paper aims to examine the relationship between access to technology, digital literacy, digital entrepreneurial intent, and female empowerment, using data from 217 female university students in Saudi Arabia. Conformity factor analysis (CFA) and multivariate covariance-based structural equation modelling (CB-SEM) were utilised to explore this complex relationship. The path analysis reveals a significant link between access to technology and female empowerment. Technology can substantially influence individuals' lives by enabling women to make informed decisions and shape their futures, thus promoting gender equality. For young students especially, access to and use of technology can positively support their social inclusion and independence. An important positive effect of digital literacy on both digital entrepreneurial intent and female empowerment is also observed. The ability to effectively use communication and information technology depends on access to and proficiency with such technology. Additionally, individuals' motivation to seek information and their plans to attain business objectives using the Internet rely on their digital literacy. Finally, the results confirm a significant mediating role of digital literacy in the influence of access to technology on digital entrepreneurial intent and female empowerment, suggesting that individuals can only benefit from access to technology if they have the ability to utilise communication and information technology.

Keywords access to technology, digital literacy, digital entrepreneurship intention, female empowerment, Saudi Arabia

JEL Classification M19, M20

Received on: 13th of April, 2025
Accepted on: 20th of June, 2025
Published on: 1st of July, 2025

Ali Saleh Alshebami, Ph.D., Associate Professor, Applied College, King Faisal University, Saudi Arabia. (Corresponding author)

Syed Ali Fazal, Ph.D., Associate Professor, BRAC Business School, BRAC University, Bangladesh.

Abdullah M. Aljarodi, Ph.D., Assistant Professor, Business College, King Abdulaziz University, Saudi Arabia.

Nowshin Zarin, MBA, Lecturer, Department of Business Administration, University of Scholars, Bangladesh.

Abdullah Hamoud Ali Seraj, Ph.D., Assistant Professor, Management Department, King Faisal University, Saudi Arabia.

Elham Alzain, Ph.D., Assistant Professor, Applied College, King Faisal University, Saudi Arabia.

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

INTRODUCTION

Women's empowerment is essential for reaching Sustainable Development Goal 5, which focuses on eliminating bias and unfair treatment against females, ensuring active female participation, and providing fair access to leadership roles by improving access to and utilisation of technology (Tabassum et al., 2019). Gender equality and female empowerment are vital objectives that significantly influence all other developmental goals (Meherali et al., 2021). However, women, especially in low-income, resource-limited countries, encounter distinct challenges (Meherali et al., 2021; Alshebami & Alzain, 2022; Niroo & Crompton, 2022). Women in developing nations often have limited control over resources, a constrained role in decision-making, restricted mobility, and insufficient skills, all of which heighten their vulnerability. Despite its importance, the statistics on female empowerment remain disappointing, highlighting a substantial knowledge

gap, as researchers and scholars face limitations in providing concrete empirical data, particularly in Saudi Arabia (Parveen, 2022). Alhawsawi and Jawhar (2023) contend that, despite the Saudi 2030 vision's pledge to empower women through employment and education, the available literature on these issues remains limited.

Apart from empowerment, limited research has examined the predictors of digital entrepreneurship (Huang et al., 2022). Existing studies show that less than 10% of entrepreneurial research focuses on women, with only a few studies available on female entrepreneurs in Saudi Arabia (Ali et al., 2019; Alomar, 2023). Furthermore, Setiawati et al. (2022) highlighted that research explores the link between digital skills and the desire to start a business. Access to technology remains a major obstacle, especially in rural regions (Hussain & Phulpoto, 2024). Although women worldwide can access learning through technology, scholarly research on how such access could empower women remains limited (Niroo & Crompton, 2022). A better understanding of the role of technology in empowering women is lacking (Mackey & Petrucka, 2021). Additionally, evidence on the effectiveness of digital literacy in improving women's financial empowerment is inconclusive, underscoring the need for further rigorous research into the relationship between digital literacy and female empowerment (Meherali et al., 2021).

1. LITERATURE REVIEW AND HYPOTHESES

The 2020 report of the World Bank praised the women empowerment agenda in the Vision 2030 manifesto by recognising Saudi Arabia as one of the nations making the greatest progress in gender equality since 2017, thanks to the increasing freedom of economic and mobility opportunities for women in Saudi Arabia (Rizvi & Hussain, 2022). Alhawsawi and Jawhar (2023) emphasised that Saudi Arabia's Vision 2030 seeks to strengthen women's roles by promoting access to jobs and educational opportunities. According to Parveen (2022), the Saudi government has introduced various reforms and policies to empower women and promote gender equality. The research highlighted significant changes that have led to increased participation of Saudi women in education, the labour market, and economic activities. Additionally, the Saudi government has broadened women's social engagement, creating a new social environment where women actively partake in business opportunities (Alzamel et al., 2020). Despite these advances, women in Saudi Arabia still face unemployment issues and exhibit poorer economic participation compared to men (Parveen, 2022). Moreover, although the Saudi government has launched multiple programmes to encourage women's entrepreneurship, only a few women have capitalised on these opportunities (Alomar, 2023).

Islam (2020) observed that women, especially entrepreneurs in developing countries, face delays in leadership, economic participation, and empowerment. Entrepreneurship is gaining momentum in attracting young people to become entrepreneurs after graduation (Santoso & Oetomo, 2016; Alshebami et al., 2024). According to Santoso and Oetomo (2016), entrepreneurship is viewed as a positive force for creating jobs and reducing unemployment worldwide, while also improving societal quality of life through value addition and the effective organisation of productive resources. Notably, entrepreneurial women often have greater freedom to make political, social, and personal decisions (Tabassum et al., 2019). Beyond entrepreneurship, technology can greatly influence individuals' lives across the globe, empowering women to make informed decisions and promote gender equality (Niroo & Crompton, 2022). Access to and utilisation of technology can positively impact young adults, encouraging their societal inclusion and supporting their independence (Khanlou et al., 2021). According to Niroo and Crompton (2022), limited access to technological resources in rural and low-income countries creates cultural and gender barriers. Recent research suggests that digital literacy is a key technological enabler of female empowerment (Meherali et al., 2021). Hussain and Phulpoto (2024) argue that digital literacy is becoming increasingly crucial for empowering individuals in various aspects of life in today's digital era. Access to technology constitutes digital inclusion and should promote

http://dx.doi.org/10.21511/ppm.23(3).2025.01

the inclusive and effective utilisation of digital tools (Shaw, 2023). The literature review highlights the potential influence of access to technology and digital literacy on female empowerment and the intention to pursue digital entrepreneurship. However, the question of how digital literacy and access to technology influence digital entrepreneurial intentions and female empowerment in Saudi Arabia remains unexplored in the existing literature. Moreover, several recent studies in this area have primarily been systematic or scoping reviews, revealing a lack of empirical research, such as the present one, on the topic.

Digital entrepreneurship can be defined as the creation and pursuit of business opportunities through specialised information and communication technologies and technical operating systems (Al-Mamary & Alraja, 2022). In contrast, entrepreneurial intentions represent a desire to become self-employed or to own a business (Nathani & Dwivedi, 2019). Empirically, Santoso and Oetomo (2016) found that information technology plays a crucial role in enhancing students' engagement and enthusiasm for becoming entrepreneurs after graduation. As the business environment increasingly shifts towards a digital economy dependent on information technology (IT), entrepreneurial tendencies are shaped by individuals' knowledge of and engagement with IT and its applications (Zenebe et al., 2018). According to Huang et al. (2022), IT culture notably predicts success in digital entrepreneurship, with an individual's innovativeness and IT experience moderating the influence of IT culture on such success. Embracing innovative technologies is vital for maintaining a sustainable competitive advantage and improving the effectiveness and efficiency of entrepreneurial ventures (Neumeyer et al., 2020). Yeganegi et al. (2021) found that technology-based entrepreneurship relies on access to the latest information.

Women's empowerment pertains to females' decision-making abilities in the economic, social, and political realms of their lives, which are vital for sustainable development (Tabassum et al., 2019). Technologies generally enable individuals to network and communicate globally (Mackey & Petrucka, 2021). Technology is crucial for improving women's access to learning about mobile money, finance, microfinance, agriculture, and digital health, as well as their participation in the economic sector and other aspects of life (Niroo & Crompton, 2022). Accessing and using technology can benefit young adults by facilitating their inclusion in society and supporting their independence (Khanlou et al., 2021). It is significant to recognise that limited access to technological resources in rural and low-income countries has historically contributed to cultural gender barriers (Niroo & Crompton, 2022). According to Mackey and Petrucka (2021), technology plays varied roles in supporting and enhancing women's resources and capabilities, as those who access and benefit from technology tend to have easier access to additional resources (e.g., health challenges and promotion, education, lifestyle, and prevention).

Digital literacy refers to the ability to effectively and appropriately use communication and information technology. Although digital technology provides considerable benefits during adolescence and early adulthood, its use is often hindered by various access-related barriers, especially in developing and applying information skills, primarily through understanding and operating technological applications, as well as accessing information online and managing privacy and security concerns associated with such technology (Wijayanto et al., 2023). The main challenges to improving digital literacy include the digital divide, lack of skills, and limited access to technology (Hussain & Phulpoto, 2024). Additionally, Khanlou et al. (2021) argued that, despite the significant value of digital competencies, they are impeded by numerous access-related obstacles.

Digital entrepreneurship intention reflects individuals' desire to seek information and plan to achieve business goals using the Internet (Mugiono et al., 2021). Empirically, Mugiono et al. (2021) demonstrated that digital literacy and online business learning positively and significantly influence digital entrepreneurship intentions. Moreover, Mudasih et al. (2021) revealed that digital literacy significantly affects entrepreneurial behaviour among students. Furthermore, digital and entrepreneurial literacy positively and significantly impact students' entrepreneurial interests (Setiawati et al., 2022). Additionally, Sariwulan et al. (2020) highlighted that digital literacy has the most substantial effect on entrepreneurs' perfor-

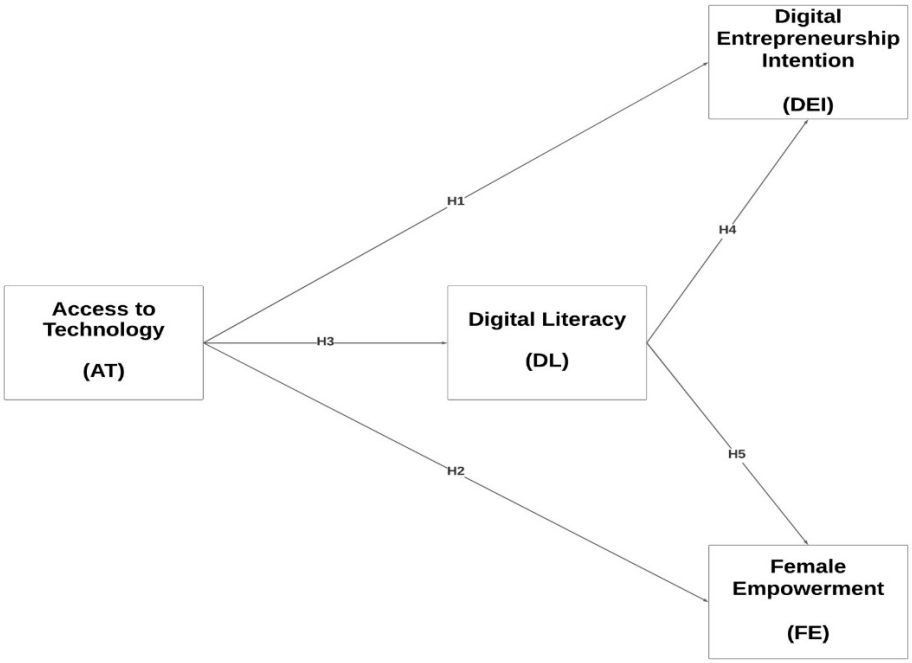

Figure 1. Research framework

mance, both directly and indirectly, in developing marketing and business networks. Interestingly, Wijayanto et al. (2023) noted that digital literacy mediates the influence of entrepreneurial knowledge on digital entrepreneurship. In contrast, Islami (2019) found that students' digital literacy had a limited impact on their entrepreneurial intentions and behaviour.

Digital literacy can be defined as individuals' ability to use digital resources and platforms to evaluate, locate, and obtain information (Hussain & Phulpoto, 2024; Meherali et al., 2021; Wijayanto et al., 2023). Having digital literacy is crucial for empowering individuals to navigate and apply technology effectively, thus enhancing their daily lives and well-being (Wijayanto et al., 2023). Recent research suggests that digital literacy can be improved through interventions such as media exposure, mobile phone use, Internet access, engagement with social media, and online education to promote female empowerment (Meherali et al., 2021). According to Hussain and Phulpoto (2024), digital literacy significantly increases economic and social participation by improving work skills, with higher levels of digital literacy leading to better employment prospects and greater involvement in online communities. This, in turn, enables the utilisation of innovative technologies to boost individuals' quality of life. It is believed that digital literacy empowers individuals to become responsible, creative, and innovative digital citizens (Hussain & Phulpoto, 2024). Additionally, digital competence is essential for women, who are regarded as key figures in community empowerment, to fulfil their roles and responsibilities in advancing societies through learning and skill acquisition (Hufad et al., 2019). Furthermore, the capacity to utilise and disseminate diverse knowledge and information effectively via digital literacy highlights the importance of developing digital literacy models that empower women (Sujarwo et al., 2022).

Motivated by Sustainable Development Goal 5 and the low participation of female students, this study aims to examine the relationship between access to technology, digital literacy, digital entrepreneurial intention, and female empowerment. Consequently, the following hypotheses are proposed:

H1: Access to technology has a significant positive effect on digital entrepreneurship intention among female university students in Saudi Arabia.

H2: Digital literacy mediates the effect of access to technology on digital entrepreneurship intention among female university students in Saudi Arabia.

http://dx.doi.org/10.21511/ppm.23(3).2025.01

H3: Access to technology has a significant positive effect on female empowerment among female university students in Saudi Arabia.

H4: Access to technology has a significant positive effect on digital literacy among female university students in Saudi Arabia.

H5: Digital literacy has a significant positive effect on digital entrepreneurship intention among female students in Saudi Arabia.

H6: Digital literacy has a significant positive effect on female empowerment among female university students in Saudi Arabia.

H7: Digital literacy mediates the effect of access to technology on female empowerment among female university students in Saudi Arabia.

The research framework for this study is presented in Figure 1.

2. METHODS

This paper employs quantitative primary data from university students to investigate the relationship between access to technology, digital literacy, digital entrepreneurial intent, and female empowerment. The university student sample is ideal for this study for two main reasons. Firstly, university students are more inclined to explore career paths such as entrepreneurship (Fayolle & Gailly, 2015). Secondly, digital technologies are more accessible to students, enabling them to adopt a more proactive role in creating a product or service (Nguyen & Nguyen, 2024). Data were gathered through a survey featuring Likert-scale statements and closed-ended questions. According to Brewer and Miller (2003), quantitative methods like surveys and interviews are more frequently used than qualitative research, which focuses on social interactions. In this approach, the collected data clearly illustrate the relationships between variables. Consequently, survey statistics are commonly employed in positivist studies based on the assumption that social phenomena are governed by natural laws. A stratified purposeful sampling technique, combined with convenience sampling, was utilised (Lynn, 2019; Etikan et al., 2015). This method enables the identification of a specific group: university students enthusiastic about advanced technology and entrepreneurial pursuits. The sample includes female students from all years enrolled in various business courses and programmes at Applied College in King Faisal University, and Business Administration College in Hail University, Saudi Arabia.

The questionnaires used in this study were sourced from earlier research in the field of entrepreneurship (Kabeer, 1999; Liñán & Chen, 2009; Ng, 2012; Van Deursen & Van Dijk, 2014). To ensure the validity, clarity, and readability of the questionnaires, a pilot test was conducted and distributed to five students for readability assessment and to five faculty members for review. Feedback from both faculty and students was vital in confirming the questionnaires' suitability for the Saudi context. Consequently, several modifications were made to improve the questionnaires for their intended purpose. The survey was then distributed to students at the Applied College at King Faisal University and the Business Administration College at Hail University. Due to a low response rate, two additional reminder emails were sent to the selected participants to encourage completion. As a result, 217 completed responses were collected for analysis.

The operationalisation of the constructions is based on validated scales. This paper uses two dependent variables. The first is digital entrepreneurship intention, which measures individuals' intended to start a technology-based enterprise. The study employs questionnaires established by Liñán and Chen (2009). The questionnaire includes six statements assessing the respondent's intention to start a digital business, such as "My professional goal is to start a digital business." These six statements were combined into one factor after performing factor analysis, a conformity factor analysis test. The second dependent variable is female empowerment. The study followed Kabeer (1999), measuring how empowered female students feel in making decisions, accessing resources, and achieving goals. Kabeer (1999) proposed four statements, including "I feel empowered to make decisions about my own education," "I believe I can have an impact on my family or community through my achieve-

ments," "I feel confident that I can succeed in areas traditionally dominated by men," and "I have the power to shape my own future and career."

The independent variable in this paper is access to technology, measured by how easily respondents can reach technological tools and platforms (Van Deursen & Van Dijk, 2014). This factor is based on four statements: "I have easy access to computers or smartphones for my studies," "I can access the Internet whenever I need it," "The quality of my Internet connection is sufficient for online learning and gathering information," and "I have access to the latest technological tools that help me improve my skills." Next, the mediating variable is digital literacy, which evaluates the respondent's ability to use digital tools and platforms effectively (Ng, 2012). The mediating variable includes four aspects: "I can easily search for and find information online," "I am comfortable using digital tools like email, word processing and social media," "I can troubleshoot and resolve basic technical issues on my own," and "I can use different digital platforms to communicate and collaborate with others."

3. RESULTS

Table 1 presents the demographic characteristics of the sample. Consequently, 99% of the participants are aged between 18 and 29 years. Regarding marital status, the majority are single (85.25%), followed by 11.98% who are married. The findings show that 93% of the students hold a diploma, while only 7% aim to obtain a bachelor's degree.

Table 1. Demographic characteristics

Factor	Respondent's profile	(%)	Frequency
Age	Age between 18–29	99.08	215
	Age above 29	0.92	2
Education	Bachelor	6.91	15
	Diploma	93.09	202
Marital Status	Married	11.98	26
	Single	85.25	185
	Other	2.76	6

A multivariate covariance-based structural equation modeling (CB-SEM) approach is employed. STATA 14.1 software is utilized to analyze and report the findings. The CB-SEM facilitates a deeper understanding of complex relationships (Bollen & Long, 1993). This method requires a minimum of 100 observations, with more than 200 observations considered robust (Moysidou & Hausberg, 2020). Therefore, the sample size of this paper is 217, which is deemed appropriate and robust. Data analysis consists of two steps. First, exploratory factor analysis (EFA) is employed to ascertain the loadings of items on the expected latent constructs. The results indicate item coefficients above 3, which is a positive sign that the data are suitable for EFA (Tabachnick & Fidell, 2007). Kaiser-Meyer-Olkin (KMO) and Cronbach's Alpha tests were also conducted to evaluate reliability (Yong & Pearce, 2013). As a rule of thumb, KMO values range from 0 to 1, where a minimum value of 0.70 is considered acceptable, and a value closer to 1 is ideal for sample size analysis. Cronbach's Alpha measures the reliability of a set of scales, also ranging from 0 to 1; a value of 0.70 is acceptable, with higher values indicating greater internal consistency (Christmann & Van Aelst, 2006). The results display the four items in such an order: access to technology (KMO: 0.76; Alpha: 0.78), digital literacy (KMO: 0.78; Alpha: 0.76), digital entrepreneurship intention (KMO: 0.93; Alpha: 0.96), and lastly female empowerment (KMO: 0.79; Alpha: 0.82), indicating that the data used are robust and reliable for presenting the constructs.

The second step is the CFA, which improves the reliability and validity of the scales used in this study (Goretzko et al., 2024). First, the Chi-Square Test (χ^2) evaluates the model's fit ($p > 0.05$), indicating a good fit for the sample size. Second, the Root Mean Square Error of Approximation (RMSEA) measures the error per degree of freedom; a value of 0.06 or below indicates a good fit. Third, the Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) help assess how well the model fits compared to the baseline model, with a threshold of 0.95 needed for a good fit. Lastly, the Standardized Root Mean Square Residual (SRMR), which measures the "average discrepancy between observed and predicted correlation," suggests that a good fitting model should have a value of 0.08 or lower.

Table 2 shows that the observed dataset covers access to technology, digital literacy, digital entrepreneurship, and female empowerment. Furthermore, Fornell and Larcker (1981) suggested that the CFA requires convergent and discriminant validity for

http://dx.doi.org/10.21511/ppm.23(3).2025.01

Table 2. Confirmatory factor analysis, reliability, and validity statistics

Constructs (CODE)	Fit Statistics (Value)							
	Factor Loadings	χ^2	RMSEA	CFI	TLI	SRMR	CR	AVE
Access to Technology	0.5711	0.47	0.000	1.000	1.01	0.012	0.767	0.457
	0.7343							
	0.7757							
	0.5994							
Digital Literacy	0.6449	0.99	0.000	1.000	1.03	0.002	0.738	0.416
	0.6032							
	0.6526							
	0.6662							
Digital Entrepreneurship	0.7861	0.19	0.042	1.000	1.000	0.010	0.958	0.781
	0.9163							
	0.9230							
	0.9251							
	0.8825							
	0.863							
Female Empowerment	0.7103	0.44	0.000	1.000	1.000	0.011	0.803	0.506
	0.6420							
	0.7250							
	0.7623							

reliability assessment. Composite reliability (CR) and average variance extracted (AVE) were calculated to achieve this. The CR recommends a threshold of 0.5 or higher, while the AVE recommends 0.7 or higher (Hair et al., 2010). Although the CR for access to technology and digital literacy factors was slightly below the 0.5 threshold by a few minor points, the factors in the models demonstrate sufficient convergent and discriminant validity (see Table 2).

Table 3 presents the findings from the SEM results. The results show a positive yet insignificant relationship between technology access and digital entrepreneurship intention ($\beta = 0.21$, $p > 0.10$). Therefore, H1, which proposed that access to technology positively influences digital entrepreneurship among female university students in Saudi Arabia, is not supported. However, the findings support H3, indicating that access to technology positively affects female empowerment among female university students in Saudi Arabia ($\beta = 0.14$, $p < 0.10$). The study posits that access to technology positively influences digital literacy among Saudi female university students. The results demonstrate a significant and positive relationship between access to technology and digital literacy ($\beta = 0.60$, $p < 0.01$). Hence, there is sufficient statistical evidence to support H4. Concerning hypothesis four, digital literacy positively affects digital entrepreneurship intention among female Saudi students in Saudi Arabia. Based on the results ($\beta = 0.40$, $p < 0.01$), H5 is strongly supported. Finally, the paper posits that digital literacy positively influences female empowerment among female university students in Saudi Arabia. The results reveal a positive relationship between digital literacy and female empowerment ($\beta = 0.44$, $p < 0.01$). Thus, H6 is strongly supported.

The results indicate that access to technology has no direct relationship with the intention of digital entrepreneurship; however, this relationship is mediated by digital literacy (H2). This intriguing result suggests that mere accessibility to technology will not increase women's intention to start a business in the technology sector. However, digital literacy equips women with the necessary skills to launch a business; therefore, it influences their engagement in digital entrepreneurial activities. Furthermore, the outcomes support the idea that access to technology has a direct and positive relationship with female empowerment, which is indirectly mediated by digital literacy (H7). This suggests that access to technology provides the tools that women utilize, while digital literacy enhances their ability to use these technological tools effectively.

The overall model fits the report (RMSEA = 0.300, CFI = 0.894, SRMR = 0.067), which is deemed

Table 3. Summary of hypotheses testing

Hypothesis	Relationship	Effect (β)	Significance (p)	Conclusion
H1	AT → DEI	0.21	p > 0.05	Not supported
H2	AT → DL → DEI	0.25	p < 0.01	Supported
H3	AT → Female Empowerment	0.14	p < 0.10	Supported
H4	AT → DL	0.60	p < 0.01	Supported
H5	DL → DEI	0.40	p < 0.01	Supported
H6	DL → Female Empowerment	0.44	p < 0.01	Supported
H7	AT → DL → Female Empowerment	0.27	p < 0.01	Supported

Note: Significance: *** p <0.01, ** p < 0.05, * p < 0.10. AT: Access to Technology, DEI: Digital Entrepreneurship Intention, DL: Digital Literacy.

marginally acceptable. The coefficient of determination is 0.348, indicating that the model accounts for a moderate amount of variance in the outcome and could be enhanced by incorporating additional relevant variables. Furthermore, the study conducted a robust analysis to improve the reliability of the findings and minimize potential bias, i.e., a bootstrapping analysis with 5,000 samples at a 95% confidence level. The overall fit of the model is moderate (χ^2 = 20.562, RMSEA = 0.300, CFI = 0.864). This bootstrapping analysis affirmed the direct effect of access to technology on digital literacy, digital entrepreneurship intention, and increased female empowerment. However, the direct impact of access to technology on digital entrepreneurship or female empowerment was found to be insignificant, suggesting that digital literacy serves as a crucial mediator of these effects.

4. DISCUSSION

The results revealed that the impact of access to technology on digital entrepreneurial intention is not statistically significant. Thus, the data did not confirm H1. However, the positive beta value observed in Table 3 suggests that it could be favorable in the event of an association. Interestingly, this finding contradicts the existing literature (Santoso & Oetomo, 2016; Zenebe et al., 2018; Huang et al., 2022; Yeganegi et al., 2021) advocating the dependence of students' interest in becoming entrepreneurs on information technology. This divergence may be due to contextual differences between the present and previous studies. Saudi Arabia is culturally unique; therefore, access to technology might be a less important determinant of digital entrepreneurial intention among Saudi students. Saudi Arabia is known to have a high Internet penetration rate, thanks to its substantial investments in digital infrastructure, which is leading the Kingdom to emerge as a regional tech hub, thereby making access to technology less relevant for its residents.

On the other hand, results revealed a positive and significant indirect effect of access to technology on digital entrepreneurship intention. This confirms H2, suggesting a significant mediating effect of digital literacy on the relationship between access to technology and digital entrepreneurial intention. In line with Mackey and Petrucka (2021) and Wijayanto et al. (2023), these findings indicate that individuals can only benefit from access to technology when they can utilize communication and information technology effectively. Furthermore, the findings align with those of Wijayanto et al. (2023), reaffirming the mediating role of digital literacy between the relevant variables and digital entrepreneurship intention. Results also revealed a significant positive effect of access to technology on female empowerment, confirming H3. In alignment with existing studies (Niroo & Crompton, 2022; Mackey & Petrucka, 2021), this finding suggests that technology can significantly impact individuals' lives by empowering women to make informed choices and shape their own futures, thereby contributing to gender equality. For young students, access to and use of technology could positively facilitate their inclusion in society and support their autonomy (Khanlou et al., 2021).

Access to technology has a significant and positive impact on digital literacy, confirming H4. Consistent with existing literature (Wijayanto et al., 2023; Hussain & Phulpoto, 2024; Khanlou et al., 2021), this indicates that the ability to effective-

http://dx.doi.org/10.21511/ppm.23(3).2025.01

ly utilise communication and information technology depends on access to such technology, thus addressing various issues related to its use. Digital literacy positively influences the desire to engage in digital entrepreneurship, thereby confirming H5. In line with previous research (Mugiono et al., 2021; Mudasih et al., 2021; Setiawati et al., 2022; F. Bayrakdaroğlu & A. Bayrakdaroğlu, 2017; Sariwulan et al., 2020), this suggests that individuals' motivation to seek information and plan for achieving business goals using the Internet is contingent on their digital literacy. Finally, digital literacy has a direct, positive, and significant effect on female empowerment, confirming H6. Supporting previous studies (Hussain & Phulpoto, 2024; Meherali et al., 2021; Wijayanto et al., 2023; Hufad et al., 2019; Sujarwo et al., 2022), this finding demonstrates that individuals' capacity to utilise digital resources and platforms to evaluate, locate, and acquire information acts as a facilitator for empowerment and enhances the overall quality of life. Digital literacy also significantly mediates the effect of technology on female empowerment, confirming H7. This shows that decision-making ability, especially for females in the economic, social, and political realms, is influenced by their use of information technology, which is, in turn, determined by access to technology (Tabassum et al., 2019; Mackey & Petrucka, 2021; Niroo & Crompton, 2022; Khanlou et al., 2021).

CONCLUSION

The aim of this paper was to explore the relationship between access to technology, digital literacy, digital entrepreneurial intention, and female empowerment. Data analysis showed a significant link between access to technology and female empowerment. For young students, access to and utilisation of technology can positively support their inclusion in society and foster their independence. There is also a notable positive impact of digital literacy on both digital entrepreneurial intention and female empowerment. The ability to use communication and information technology effectively depends on access and the capacity to leverage such technology. Furthermore, individuals' motivation to seek information and plan for online business success relies on their level of digital literacy. Finally, the findings confirmed a significant mediating role of digital literacy in the relationship between access to technology and both digital entrepreneurial intention and female empowerment, suggesting that individuals can only benefit from access to technology when they are capable of effectively utilising communication and information technology.

The empirical findings show that access to technology significantly boosts female empowerment, while digital literacy positively affects both digital entrepreneurship intentions and women's empowerment. Moreover, digital literacy serves as a vital mediator between access to technology and digital entrepreneurial intent, as well as women's empowerment.

This paper offers implications for academics, practitioners, and women in general. Firstly, this study sought to bridge significant gaps in the existing literature by assessing access to technology and digital literacy among female graduates in Saudi Arabia. The findings provide empirical evidence of the interplay between access to technology, digital literacy, entrepreneurial intention, and female empowerment, a relationship that is currently underrepresented in the extant body of knowledge. Furthermore, the findings expand the limited literature in the Middle Eastern context by using Saudi Arabia as a data source for studying women's empowerment.

In terms of policy implications, this study directly contributes to the Sustainable Development Goals (SDGs) indicator for Target 5, which aims to "achieve gender equality and empower all women and girls" by improving access to and utilisation of enabling technology, along with increasing the proportion of digitally literate females. Moreover, this study raises awareness about the current level of digital literacy and technological access among the female population in the country. Furthermore, the in-depth insights support the empowerment of individuals and communities, offering practical solutions to ad-

dress existing challenges. It is anticipated that the findings will assist policymakers and development organisations in shaping strategies and training programmes to expand access to technology and digital literacy for female graduates, thereby paving the way for the development of empowered women who can contribute to Saudi Arabia's inclusive and sustainable future. To encourage young people to pursue startup ventures, it is essential to equip them with entrepreneurial knowledge through both formal and informal means and to enhance their digital literacy through education tailored to startup-related skills.

The study has limitations that future research could address and build upon. The empirical findings were based on a sample of female university students in Saudi Arabia. The survey data from a limited group of respondents did not extend to the broader research issue. Therefore, the findings should not be generalised globally without caution. Future studies could increase the sample size by including males to better understand the complex relationship between digital literacy and digital entrepreneurial intention. Additionally, comparing females with males would provide deeper insights into factors that should alert policymakers and help organisational decision-makers. More importantly, the findings of this paper can guide future research in entrepreneurship by identifying additional factors related to female empowerment that enhance their intention towards digital entrepreneurship.

AUTHOR CONTRIBUTIONS

Conceptualization: Ali Saleh Alshebami, Elham Alzain.
Data curation: Ali Saleh Alshebami, Abdullah Hamoud Ali Seraj.
Formal analysis: Ali Saleh Alshebami, Syed Ali Fazal, Abdullah M. Aljarodi, Nowshin Zarin, Abdullah Hamoud Ali Seraj.
Funding acquisition: Ali Saleh Alshebami, Nowshin Zarin.
Investigation: Syed Ali Fazal, Abdullah M. Aljarodi, Abdullah Hamoud Ali Seraj.
Methodology: Syed Ali Fazal, Nowshin Zarin, Abdullah Hamoud Ali Seraj.
Project administration: Abdullah M. Aljarodi, Abdullah Hamoud Ali Seraj.
Resources: Abdullah M. Aljarodi, Elham Alzain.
Software: Syed Ali Fazal, Abdullah M. Aljarodi, Nowshin Zarin.
Supervision: Nowshin Zarin.
Validation: Syed Ali Fazal.
Visualization: Ali Saleh Alshebami.
Writing – original draft: Ali Saleh Alshebami, Syed Ali Fazal.
Writing – review & editing: Abdullah M. Aljarodi, Nowshin Zarin, Abdullah Hamoud Ali Seraj, Elham Alzain.

FUNDING

This work was supported by the Deanship of Scientific Research, Vice President for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [KFU251947].

REFERENCES

1. Alhawsawi, S., & Jawhar, S. S. (2023). Education, employment, and empowerment among Saudi women. *Gender and Education, 35*(4), 401-419. https://doi.org/10.1080/09540253.2023.2189917
2. Ali, I., Ali, M., & Badghish, S. (2019). Symmetric and asymmetric modeling of entrepreneurial ecosystem in developing entrepreneurial intentions among female university students in Saudi Arabia. *International Journal of Gender and Entrepreneurship, 11*(4), 435-458. https://doi.org/10.1108/IJGE-02-2019-0039
3. Al-Mamary, Y. H. S., & Alraja, M. M. (2022). Understanding entrepreneurship intention and behaviour in the light of the TPB model from the digital entrepre-

http://dx.doi.org/10.21511/ppm.23(3).2025.01

neurship perspective. *International Journal of Information Management Data Insights, 2*(2), Article 100106. https://doi.org/10.1016/j.jjimei.2022.100106

4. Alomar, J. A. (2023). Assessing factors influencing female entrepreneurship intentions and behaviour. *FIIB Business Review*. https://doi.org/10.1177/23197145221146348
5. Alshebami, A. S., Alamri, M. M., Alzain, E., Algobaei, F., Hamoud, A., Seraj, A., Handhal, S., Marri, A., & Al-duraywish, A. A. (2024). Caffeinating entrepreneurship: Understating the factors driving coffee farming entrepreneurial intentions among potential entrepreneurs. *Sustainability, 16*(17), Article 7824. https://doi.org/10.3390/su16177824
6. Alshebami, A., & Alzain, E. (2022). Toward an ecosystem framework for advancing women's entrepreneurship in Yemen. *Frontiers in Education, 7*. https://doi.org/10.3389/feduc.2022.887726
7. Alzamel, S., Nazri, M., & Omar, S. (2020). Factors influencing e-entrepreneurial intention among female students in Saudi Arabia. *International Journal, 9,* 1996-2003. https://doi.org/10.6000/1929-4409.2020.09.234
8. Bayrakdaroğlu, F., & Bayrakdaroğlu, A. (2017). A comparative analysis regarding the effects of financial literacy and digital literacy on Internet entrepreneurship intention. *Journal of Entrepreneurship & Development/ Girisimcilik ve Kalkinma Dergisi, 12*(2). Retrieved from https://www.semanticscholar.org/paper/A-Comparative-Analysis-Regarding-The-Effects-of-and-Bayrakdaroglu-Bayrakdaro%C4%9Flu/ffeef71de37a707f45964517d2efdfb89755588b
9. Bollen, K. A., & Long, J. S. (1993). *Testing structural equation models*. Sage.
10. Brewer, J. D., & Miller, R. L. (2003). *The AZ of social research: a dictionary of key social science research concepts.* Thousand Oaks, California, USA: Sage Publications.
11. Christmann, A., & Van Aelst, S. (2006). Robust estimation of Cronbach's alpha. *Journal of Multivariate Analysis, 97*(7), 1660-1674. https://doi.org/10.1016/j.jmva.2005.05.012
12. Etikan, I., Musa, S. A., & Alkassim, R. S. (2015). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1-5. https://doi.org/10.11648/j.ajtas.20160501.11
13. Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of Small Business Management, 53*(1), 75-93. https://doi.org/10.1111/jsbm.12065
14. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50. https://doi.org/10.1177/002224378101800104
15. Goretzko, D., Siemund, K., & Sterner, P. (2024). Evaluating model fit of measurement models in confirmatory factor analysis. *Educational and Psychological Measurement, 84*(1), 123-144. https://doi.org/10.1177/00131644231163813
16. Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate data analysis* (7th ed.). Pearson.
17. Huang, T. C., Wang, Y. J., & Lai, H. M. (2022). What drives Internet entrepreneurial intention to use technology products? An investigation of technology product imagination disposition, social support, and motivation. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.829256
18. Hufad, A., Purnomo, S. N., & Rahmat, A. (2019). Digital literacy of women as the cadres of community empowerment in rural areas. *International Journal of Innovation, Creativity and Change, 9*(7), 276-288. Retrieved from https://www.ijicc.net/images/vol9iss7/9718_Hufad_2019_E_R.pdf
19. Hussain, N., & Phulpoto, S. (2024). Digital literacy: Empowering individuals in the Digital Age. *Assyfa Learning Journal, 2*(2), 70-83. https://doi.org/10.61650/alj.v2i2.231
20. Islam, N. (2020). Women empowerment through entrepreneurship development in Bangladesh: A multivariate analysis. *International Journal of Management, 11*(10). Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3734569
21. Islami, N. N. (2019). The effect of digital literacy toward entrepreneur behaviors through students' intention entrepreneurship on Economics Education Study Program at Jember. *IOP Conference Series: Earth and Environmental Science, 243*(1), Article 012084. https://doi.org/10.1088/1755-1315/243/1/012084
22. Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change, 30*(3), 435-464. https://doi.org/10.1111/1467-7660.00125
23. Khanlou, N., Khan, A., Vazquez, L. M., & Zangeneh, M. (2021). Digital literacy, access to technology and inclusion for young adults with developmental disabilities. *Journal of Developmental and Physical Disabilities, 33,* 1-25. https://doi.org/10.1007/s10882-020-09738-w
24. Liñán, F., & Chen, Y.-W. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship Theory and Practice, 33*(3), 593-617. https://doi.org/10.1111/j.1540-6520.2009.00318.x
25. Lynn, P. (2019). The advantage and disadvantage of implicitly stratified sampling. *Methods, Data, Analyses: A Journal for Quantitative Methods and Survey Methodology, 13*(2), 253-266. https://doi.org/10.12758/mda.2018.02
26. Mackey, A., & Petrucka, P. (2021). Technology as the key to women's empowerment: A scoping review. *BMC Women's Health, 21*. https://

doi.org/10.1186/s12905-021-01225-4

27. Meherali, S., Rahim, K. A., Campbell, S., & Lassi, Z. S. (2021). Does digital literacy empower adolescent girls in low- and middle-income countries: A systematic review. *Frontiers in Public Health, 9*. https://doi.org/10.3389/fpubh.2021.761394

28. Moysidou, K., & Hausberg, J. P. (2020). In crowdfunding we trust: A trust-building model in lending crowdfunding. *Journal of Small Business Management, 58*(3), 511-543. https://doi.org/10.1080/00472778.2019.1661682

29. Mudasih, I., Subroto, W.T., & Susanti. (2021). The effect of financial literacy, digital literacy, and entrepreneurial learning outcome on entrepreneur behavior of students at SMK Negeri 1 Surabaya. *Technium Social Sciences Journal, 15,* 303-320. Retrieved from https://techniumscience.com/index.php/socialsciences/article/view/2124/914

30. Mugiono, M., Prajanti, S. D. W., & Wahyono, W. (2021). The effect of digital literacy and entrepreneurship education towards online entrepreneurship intention through online business learning and creativity at marketing department in Batang regency. *Journal of Economic Education, 10*(1), 21-27. Retrieved from https://journal.unnes.ac.id/sju/jeec/article/view/41304

31. Nathani, N., & Dwivedi, G. (2019). Influence of technology entrepreneurship on entrepreneurial intentions: A cross country analysis. *Proceedings of 10th International Conference on Digital Strategies for Organizational Success*. https://doi.org/10.2139/ssrn.3319889

32. Neumeyer, X., Santos, S. C., & Morris, M. H. (2020). Overcoming barriers to technology adoption when fostering entrepreneurship among the poor: The role of technology and digital literacy. *IEEE Transactions on Engineering Management, 68*(6), 1605-1618. https://doi.org/10.1109/TEM.2020.2989740

33. Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education, 59*(3), 1065-1078. https://doi.org/10.1016/j.compedu.2012.04.016

34. Nguyen, P. N.-D., & Nguyen, H. H. (2024). Unveiling the link between digital entrepreneurship education and intention among university students in an emerging economy. *Technological Forecasting and Social Change, 203,* Article 123330. https://doi.org/10.1016/j.techfore.2024.123330

35. Niroo, W. T., & Crompton, H. (2022). Women's empowerment through the use of technology. *Asian Journal of Distance Education, 17*(2). Retrieved from https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/675

36. Parveen, M. (2022). Women empowerment: New paradigm shift of Saudi women into labor workforce. *Society and Business Review, 17*(1), 66-91. https://doi.org/10.1108/SBR-10-2020-0123

37. Rizvi, L. J., & Hussain, Z. (2022). Empowering woman through legal reforms-evidence from Saudi Arabian context. *International Journal of Law and Management, 64*(2), 137-149. https://doi.org/10.1108/IJLMA-03-2021-0068

38. Santoso, D. S., & Oetomo, B. (2016). Relationship between entrepreneurial skills, entrepreneurial orientation, and information technology to entrepreneurship intention: Cases in Indonesia. *International Journal of Management Sciences and Business Research, 5*(4). Retrieved from https://ssrn.com/abstract=2848126

39. Sariwulan, T., Suparno, S., Disman, D., Ahman, E., & Suwatno, S. (2020). Entrepreneurial performance: The role of literacy and skills. *The Journal of Asian Finance, Economics and Business, 7*(11), 269-280. https://doi.org/10.13106/jafeb.2020.vol7.no11.269

40. Setiawati, R., Adriani, Z., & Wediawati, B. (2022). Entrepreneurial interest in startup business based on entrepreneurial literacy and digital literacy. *Jurnal Perspektif Pembiayaan Dan Pembangunan Daerah, 10*(4), 235-250. https://doi.org/10.22437/ppd.v10i4.18819

41. Shaw, R. J. (2023). Access to technology and digital literacy as determinants of health and health care. *Creative Nursing, 29*(3), 258-263. https://doi.org/10.1177/10784535231211682

42. Sujarwo, S., Tristanti, T., & Kusumawardani, E. (2022). Digital literacy model to empower women using community-based education approach. *World Journal on Educational Technology: Current Issues, 14*(1), 175-188. https://doi.org/10.18844/wjet.v14i1.6714

43. Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Allyn & Bacon.

44. Tabassum, M., Begum, N., Rana, M. S., Faruk, M. O., & Miah, M. M. (2019). Factors influencing women's empowerment in Bangladesh. *Science, Technology and Public Policy, 3*(1), 1-7. https://doi.org/10.11648/j.stpp.20190301.11

45. Van Deursen, A. J., & Van Dijk, J. A. (2014). The digital divide shifts to differences in usage. *New Media & Society, 16*(3), 507-526. https://doi.org/10.1177/1461444813487959

46. Wijayanto, G., Ayesha, I., Wibowo, T. S., Suparwata, D. O., Suroso, A., & Fathurohman, A. (2023). The influence of digital literacy mediation on the effect of entrepreneurship knowledge on technoprenuership. *International Journal of Economics, Business and Accounting Research (IJEBAR), 7*(1). Retrieved from https://jurnal.stie-aas.ac.id/index.php/IJEBAR/article/view/8412

47. Yeganegi, S., Laplume, A. O., & Dass, P. (2021). The role of information availability: A longitudinal analysis of technology entrepreneurship. *Technological Forecasting and Social Change, 170,* Article 120910. https://doi.org/10.1016/j.techfore.2021.120910

48. Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology, 9*(2), 79-94. https://doi.org/10.20982/tqmp.09.2.p079

49. Zenebe, A., Alsaaty, F. M., & Anyiwo, D. (2018). Relationship between individual's entrepreneurship intention, and adoption and knowledge of information technology and its applications: An empirical study. *Journal of Small Business & Entrepreneurship, 30*(3), 215-232. https://doi.org/10.1080/08276331.2017.1397441

http://dx.doi.org/10.21511/ppm.23(3).2025.01