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Bridging Digital Awareness and Entrepreneurial Readiness: ICT-Enabled Entrepreneurship Among Omani Undergraduates

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ABSTRACT: Digital entrepreneurship (DE) has emerged as a key driver of innovation, economic diversification, and employment generation in the digital economy, with information and communication technology (ICT) serving as a critical enabler of entrepreneurial activity. This study examines Omani undergraduate students' awareness of ICT-enabled digital entrepreneurship, their motivational orientation toward engaging in digital entrepreneurial activities, and the perceived challenges that hinder practical entrepreneurial participation. Using a quantitative diagnostic approach, data were collected from 380 students across four universities in Oman through a structured 30-item questionnaire. Descriptive and inferential statistical analyses were conducted using IBM SPSS Statistics to assess relationships among awareness, motivation, and perceived barriers. The findings reveal that students demonstrate relatively high conceptual awareness of ICT's role in entrepreneurship and moderate-to-high motivational orientation toward digital entrepreneurial engagement. However, students report lower confidence in practical entrepreneurial competencies, particularly regarding risk-taking and implementation-related skills. Gender differences significantly influence both awareness and motivation, with female students demonstrating higher motivational orientation than male students, while both groups experience similar structural and practical barriers to ICT-enabled entrepreneurship. The study identifies a substantial gap between conceptual understanding and practical entrepreneurial readiness among undergraduate students. These findings contribute to the growing literature on digital entrepreneurship in higher education by highlighting the need for stronger integration of experiential learning, industry collaboration, mentorship, and practice-oriented entrepreneurial training within university curricula. The study also provides practical implications for policymakers and educational institutions seeking to strengthen digital entrepreneurial capacity in support of Oman Vision 2040 and the country's broader goals of economic diversification and digital transformation.

Keywords: Digital entrepreneurship, Information and communication technology (ICT), Entrepreneurial awareness, Motivational orientation, Higher education.

I. INTRODUCTION

Digital entrepreneurship (DE) encompasses entrepreneurial activities that rely on digital technologies (digital platforms, online business models, and ICT-enabled processes) as a core means of creating, delivering, facilitating, and mediating entrepreneurial initiatives [1-3]. Many industries have embraced ICT to improve their services; similarly, education has integrated ICT to foster innovation and enterprise and cultivate 21st-century essential skills such as critical thinking, digital proficiency, teamwork, and language

competency [4]. Innovation-oriented education models have been recognized as a contributory element in supporting the preparation and development of graduate skills and pre-entrepreneurial orientation to meet anticipated requirements in future labor markets [5, 6]. As a result, innovation and entrepreneurship education (EE) has become crucial for refining innovative abilities and entrepreneurial mindsets that contribute to national economic development [7]. Thus, due to the integration of DE education, universities are leveraging technology to enhance their students' creative and entrepreneurial talents.

ICT is regarded as an indispensable prerequisite for DE; however, individuals' capabilities to engage in digital entrepreneurial activities are heterogeneous [8, 3]. Considerably, undergraduate students vary in their awareness, confidence, and perceived capability to meaningfully employ ICT for entrepreneurial purposes [9, 10]. In this respect, the study did not investigate ICT adoption versus non-adoption; instead, it assessed students' awareness, motivational orientation, and the challenges they faced in ICT-enabled DE. Yet digital entrepreneurship, a relatively new phenomenon, has proven to be a significant catalyst in changing the conventional business landscape of small and medium-sized organizations, expanding access to digital platforms, driving strategic digital adoption, and fostering innovation-driven growth [11-13]. Therefore, innovation and entrepreneurship education should be strategically aligned with labor-market and employer needs, ensuring that higher education programs equip students with relevant, employable skills and competencies that enhance their professional awareness and entrepreneurial capacity [14-16].

Like many other nations worldwide, Oman has sought to integrate entrepreneurship and innovation into its higher education curricula. To promote a genuine entrepreneurial spirit among its students and enable them to start businesses and create jobs, the Ministry of Education (MOE) has effectively used technology [17]. Although EE was introduced in 2015, few studies have evaluated its effectiveness [17]. Higher education institutions are being positioned as relevant actors at the center of digital innovation and entrepreneurial ecosystems. The important role of higher education institutions in developing students' entrepreneurial capacity and digital competencies has been underscored [18]. In this respect, universities can no longer be treated as pure providers of knowledge but as institutional environments capable of shaping students' entrepreneurial orientations, awareness, and forms of engagement with digitally enabled opportunities. As a result, entrepreneurs need to learn to make good use of technology while also anticipating its consequences for business growth and continuity [19]. The incentives and drawbacks of ICT adoption can only be portrayed when students use it in learning.

In accordance with Oman's Vision 2040, higher education institutions are expected to provide students with advanced digital literacy skills, an entrepreneurial mindset, and an innovation-driven service approach to enable future prospective entrepreneurs to adapt to the rapidly changing labor market [20]. Nevertheless, empirical studies have revealed that there are existing challenges that hinder the translation of entrepreneurship education into practical digital entrepreneurial orientation, in particular regarding experiential learning and applied skills development [5, 6]. Critiques state that entrepreneurship education has focused on students' conceptual understanding and attitude building instead of promoting the implementation of DE [6, 21]. Therefore, this critique demonstrates the necessity of examining whether students in higher education institutions are aware, ready, willing, and motivated to join the entrepreneurial field through the lens of ICT-enabled digital entrepreneurial ventures.

Despite the Omani government's commitment to promoting ICT for innovation, significant gaps remain. Innovation plays a major role in both economic growth and societal well-being; however, the absence of innovation capabilities hampers economic growth, diminishes societal well-being, and undermines educational foundations that support growth and development [22-24]. Omani youth still lack hands-on entrepreneurship experience and face challenges in acquiring practical skills and knowledge in entrepreneurship [25, 26]. Therefore, educational institutions need to implement more effective strategies to better integrate technology into EE [27]. Although there has been some progress in innovation dynamics since 2013 [28], Oman's global rank in the Global Innovation Index has fallen each year, from 69th in 2018 to 74th in 2024 [29, 30]. This situation has spurred calls for a comprehensive review of Oman's innovation landscape.

This study is expected to provide multifaceted practical and theoretical contributions. For example, the findings offer practical guidance to the Ministry of Education (MOE) policymakers for developing a framework to assess, plan, and propose the required modifications for DE promotion. Moreover, MOE would continuously revise the strategies used to present development programs to align with global changes and ICT advancements. The results would also encourage stakeholders, decision-makers, administrators, and Omani society organizations to cooperate to strengthen the approval of ICT as a tool for developing DE. Researchers and academics might conduct further research to develop entrepreneurial academic programs. Focusing specifically on final-year undergraduates, the study allowed for understanding perceptions of digital entrepreneurial awareness, motivations, and challenges among those transitioning to the labor market. This research was guided by the following questions:

- What is the level of awareness among Omani undergraduate students of ICT's role in DE?
- What is the level of motivational orientation among Omani undergraduate students to engage in ICT-enabled DE?
- What perceived challenges do Omani undergraduate students associate with using ICT for DE development?
- Are there statistically significant differences in undergraduate students' awareness, motivation, and perceived challenges by gender, age, and academic major?
- What associations exist among awareness, motivation, and perceived challenges in the context of ICT-enabled digital entrepreneurship?

II. LITERATURE REVIEW

The evolution of technology has significantly changed teaching and learning practices. This study aimed to assess perceptions of ICT use for DE promotion and innovation. Based on the research objectives, which sought to investigate university students' awareness, motivational orientation, and perceived challenges regarding the use of ICT in DE, this literature review will shed light on these elements:

1. MOTIVATIONS OF ICT USE

Integrating ICT in education promotes ongoing learning regardless of time or location, with the internet serving as the primary source of knowledge. ICT infrastructure enhances teaching, learning, and assessment, contributing to high-quality education in the 21st century [31]. Having ICT skills gives learners a significant advantage in a technology-driven world [32]. ICT plays a substantial role in national progress by promoting economic growth, improving societal well-being, and supporting development plans across various fields, thereby promoting sustainable and inclusive societal development [33, 34]. Additionally, ICT boosts a nation's macro and microeconomic competitiveness [35]. Organizational culture, leadership support, and employee behavioral readiness are crucial factors that affect the successful adoption of technological systems, as they shape attitudes and orientation for digital transformation [37-39]. User acceptance remains one of the biggest obstacles to technology integration [40].

Due to its ability to promote competencies such as creativity, autonomy, critical thinking, and problem-solving across any sector, ICT is essential to innovation and digital education in our time [41, 42]. These technologies enable knowledge sharing, collaborative work, and improved productivity. Moreover, ICT has developed digital tools and greatly increased access to international research networks [4]. Furthermore, students can develop essential competencies for entrepreneurship and employment through the use of ICT [43]. Additionally, the positive impact of ICT is evident in improved communication channels, academic performance, and research quality in higher education contexts.

Internal and external factors associated with ICT use in DE; for instance, intrinsic motivations such as self-awareness, autonomy, orientation, and readiness, along with extrinsic factors like external circumstances, networking, financial freedom, and family support, motivate individuals toward DE [44]. Technology supports various entrepreneurial endeavors by fostering innovation, improving performance, and offering flexibility [10, 45]. ICT, particularly digital platforms, serves as a facilitator, mediator, and enabler for DE because it enhances product quality and intensifies competition [3]. Cultural and regulatory

contexts, along with social capital, such as family and friends who raise funds through mentorship, crowdfunding, publicizing innovative ideas, and incubator networks, are also substantial motives for DE [46-48]. For example, the desire of Omani women to improve their quality of life, become financially independent, and gain autonomy is an incentive for DE [49].

2. CONCEPTUAL FRAMEWORK

The Theory of Planned Behavior model (TPB) [9] served as a theoretical lens for the development of the questionnaire. In this study, TPB was a sensitizing theory that guided construct selection and interpretation rather than a fully tested causal model. According to TPB, behavior is shaped by attitudes, subjective norms, and perceived behavioral control. The current study did not test the TPB structure; however, it provided a framework to understand how cognitively and motivationally undergraduate students position themselves toward IC-enabled DE. Thus, TPB is utilized interpretively rather than as a structural model. The conceptual framework suggests that awareness of ICT-enabled DE is related to the attitudinal aspect, represented by students' cognitive evaluation of DE's value and benefits. Motivational orientation represents students' willingness and psychological inclination to engage in ICT-enabled entrepreneurial activities. Perceived challenges correspond to their perception of the constraint, including both internal factors and external challenges, which shape the perceived behavioral control.

Diagnostic perception framework showing mutual, non-causal relationships between awareness, motivational orientation, and perceived challenges in ICT-enabled digital entrepreneurship. The framework is positioned within the Theory of Planned Behavior and reflects exploratory perceptual relationships rather than predictive behavioral processes. Demographic variables (gender, age, and field of study) are viewed as contextual factors for all dimensions, as seen in Figure 1.

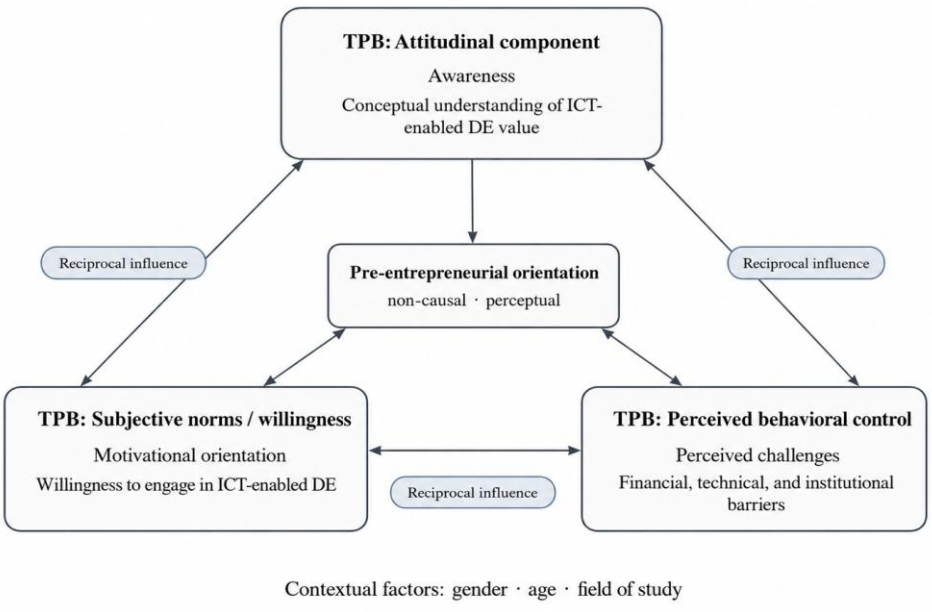

FIGURE 1. A TPB-based sensitizing framework for ICT-enabled digital entrepreneurship.

The framework does not follow a model of sequential causality. Awareness, motivational orientation, and challenges are treated as co-existing perceptual constructs. This is in line with the idea that these constructs are best interpreted as mutually informative rather than in a hierarchical relationship. This enables the framework to be applied to perceptions of early-stage entrepreneurial activity, as shown in Table 1.

Table 1. Conceptual dimensions of the diagnostic perception framework.

Dimension	Conceptual Focus	Role in the Study
Awareness	Students' conceptual understanding of ICT-enabled DE and its perceived value	Cognitive perception of DE
Motivational Orientation	Students' willingness and psychological inclination to engage in ICT-enabled entrepreneurial activity	Preparatory engagement orientation.
Perceived Challenges	Students' perception of financial, technical, and institutional barriers	Constraints shaping engagement perceptions

Collectively, these dimensions present a diagnostic perspective for understanding the way in which undergraduates position themselves toward ICT-enabled DE. The present study does not seek to measure entrepreneurial behavior but instead aims to reveal prospective perceptions that relate to how students comprehend, assess, and envisage involvement in digital enterprise settings. The model accordingly stresses perceptual alignment and constraint awareness rather than behavioral prediction. In this study, awareness, motivation, and barriers are considered interconnected but noncausal concepts within the diagnosis stage of entrepreneurial orientation.

3. DIGITAL ENTREPRENEURSHIP, INNOVATION & EDUCATION

By considering and incorporating factors such as autonomy, opportunity recognition, and anticipated economic benefits, which play an important role in supporting students' engagement with DE in universities' leadership, research, and teaching [50, 51], universities have become more entrepreneurial and fostered a sustainable entrepreneurial culture [52]. Commercializing research results is an important part of the third mission of modern universities, expanding traditional university functions: education and research, through the development of technology transfer and business partnerships [53-55]. Innovation continues to be a principal driver of long-term socio-economic and societal development [56]. The impact of quality education is highlighted by the fact that skilled workers greatly increase a firm's capacity for innovation [57]. Further, higher education is considered a major pillar of economic growth because of the inventiveness, technical skills, and risk-taking attitude that young individuals may develop during their studies. Universities have empowered economic growth in knowledge-based economies by enhancing industry technology, workforce quality, and entrepreneurial contexts [18].

In line with the Vision 2040 strategy, which aims to develop students' entrepreneurial mindsets and prepare them for future leadership roles, the Sultanate of Oman has prioritized entrepreneurship education and made it a mandatory element of its higher education system to promote entrepreneurial mindsets among its youth [58]. Despite the growth of EE in the Omani context, a debate has raged over whether it can create real entrepreneurs. This education shapes students' cognitive and non-cognitive competencies, such as risk-taking behavior, creativity, leadership, teamwork, and problem-solving [21]. Demographic variables continue to be important predictors of university students' entrepreneurial intentions in Oman. For instance, a study conducted at Sultan Qaboos University revealed significant differences in entrepreneurial intentions based on gender and level of study, reflecting the effect of demographic variance on university students' intentions toward entrepreneurship [59].

4. CHALLENGES OF ICT USE IN EDUCATION

While digital technologies have created tremendous benefits for the economy and transformed innovation systems, major problems remain [42]. One of the primary challenges affecting the development of DE education is the lack of technological knowledge among scholars, researchers, educators, and students. This can be attributed to infrastructure constraints [42]. Another obstacle is the absence of fundamental computer education among students and their limited familiarity with technology. Furthermore, demographic challenges in digital entrepreneurship persist. Poor students' basic computer skills, limited digital literacy, and under-equipped ICT infrastructure are significant barriers to effective technology use.

For instance, limited access to reliable internet and devices constrains students from leveraging digital platforms [60-62].

Study [43] identified three sources of organizational constraints, including an unstable power supply, inapplicable ICT regulations, and low levels of technology integration in the curriculum. Furthermore, creating new business ideas, setting up an employee team that could willingly pass on ethos, implementing effective marketing strategies that work instantly, managing business competitions, and facing sudden and unforeseen challenges are drawbacks of DE development. This means that institutional as well as pedagogical interventions are required to achieve any real improvement in DE

Legal environments and social norms, as well as technological infrastructure, are critical and decisive elements of DE, which may act as either facilitators or inhibitors of the phenomenon. For example, disparities in social norms and variations in technology availability are critical factors in shaping opportunities within digital entrepreneurial ecosystems [63]. Furthermore, a lack of knowledge and experience in entrepreneurship is found to be a major factor that inhibits individuals' success and participation in entrepreneurship [64]. In the context of Oman, ongoing ecosystem challenges related to innovation potential, human capital development, and institutional factors are found to be hindering entrepreneurial growth [65]. These inhibiting challenges are also augmented by structural challenges in the entrepreneurial ecosystem, including a lack of support mechanisms and market readiness, which are limiting entrepreneurial opportunities [66].

Lack of financial resources and limited technological infrastructure hamper the development of digital platforms for emerging companies, making it difficult for them to adopt effective digital transformation strategies [67]. Although the relative significance of each may vary by context, deficiencies in technical competence, financial literacy, and digital literacy seem to constrain entrepreneurial activity [68, 69]. The high cost of ICT infrastructure, software, and internet access delays digital technology adoption in resource-constrained environments, as these costs greatly reduce individuals' and organizations' potential to participate in digital transformation initiatives [31, 70]. The obstacles extend beyond the initial acquisition costs. High equipment costs and poor maintenance practices constrain long-term ICT use in many developing countries [43].

III. METHODS

Although EE was initially introduced in 2015, there is a dearth of studies that aimed to evaluate the application of such education in the Omani context [17]. Therefore, this research strived to investigate the phenomenon and estimate its prevalence in depth [71]. This study applied a quantitative methodology to collect numerical data using a survey. The questionnaire examined the level of awareness, motivational orientation, and perceived challenges among students in universities' final academic year for ICT-enabled DE. Given ICT's intrinsic role in DE, the survey was designed to examine students' awareness, motivation, and anticipated challenges rather than actual ICT adoption behavior.

1. RESEARCH PARTICIPANTS

This study implemented a systematic random sampling method to minimize selection bias and ensure sample representativeness. Lists of all final-year student enrollments were received from the Deanship of Admission and Registration at the four universities participating in the study. Based on the total number of students enrolled at each university, a sample was randomly selected by dividing the population size by the desired sample proportion. Approximately 412 students were contacted to complete the survey instrument, and approximately 380 completed it. Any incomplete questionnaires were treated as missing data and were removed from consideration. This study used a sample of 380 final-year undergraduate students from four universities in Oman: University 1, University 2, University 3, and University 4 (44% males, 56% females, see Table 2), representing students from various governorates and chosen for their demographic and geographic diversity. The sample provided insight into participants' awareness, motivations, and challenges related to the use of information and communication technology to support digital entrepreneurship among undergraduate students of various ages, genders, majors, and academic backgrounds.

This study used a systematic random sampling method targeting final-year students. Systematic random sampling is a method in which every kth item from an ordered population list is included in the sample after selecting a starting point. The research targeted the final-year undergraduates who have completed the required and elective entrepreneurship courses and have adequate exposure to represent knowledgeable perspectives on DE activities supported by ICT. Final-year students who have completed entrepreneurial courses are a representative sample for assessing pre-entrepreneurial orientation. These students are chosen because they are the prospective, entrepreneurial, and enterprising segment of the labor force. At this stage, students would have a solid foundation of conceptual knowledge and would have started developing their perceptions regarding their awareness, motivational predisposition, and challenges associated with using ICT to support their engagement in DE.

Table 2. Demographic characteristics of participants.

variable	category	n	%
University	University 1	101	27%
	University 2	79	21%
	University 3	81	21%
	University 4	119	31%
	Total	380	100%
Gender	Male	168	44%
	Female	212	56%
	Total	380	100%
Age	20-23 years	207	54%
	24-27 years	133	35%
	Above 27	40	11%
	Total	380	100%

2. RESEARCH INSTRUMENT

Based on the literature and previous studies [72, 73], a questionnaire was designed for distribution. To ensure that the survey would represent student characteristics and demographics as much as possible, the original items were modified, and new items were designed. The questionnaire was reviewed by experts in the Information Studies Department and the College of Education at University 1 to check the validity of the questionnaire. A 30-statement web-based questionnaire using a 5-point Likert scale was employed. The overall reliability of the instrument was 0.83, indicating a very high level of internal consistency. The questionnaire was divided into four parts. The first section aimed to gather basic demographic information from the participants, such as gender, age, field of study, and university. The second section consisted of 10 statements that measured students' awareness and obtained a reliability coefficient of 0.84. Students' motivational orientations toward ICT-enabled DE were also explored in the third section through ten statements, with a reliability coefficient of 0.83. The last part, which is section four, included ten items to assess students' perceptions of the challenges faced when utilizing ICTs in DE, with a reliability coefficient of 0.83, as seen in Table 3.

In addition to assessing the reliability of each section, a post hoc analysis of the measurement statements was performed to evaluate the theoretical alignment and face validity of the items in relation to the revised conceptual framework presented in the study. This review was intended to confirm that all items reflect pre-entrepreneurial orientation, motivational orientation, and perceived challenges in a manner that does not imply actual entrepreneurial experience. Conceptual clarity, construct relevance, and consistency with the Theory of Planned Behavior (TPB) were also considered. Hence, this reflective review enhanced the

interpretation of the study's findings and construct labeling without affecting the original scale structure or statistical findings.

While factor analysis techniques, including EFA and CFA, have been widely utilized in validating the construct, the current study has opted for the diagnostic and exploratory model. Measurement variables were developed from reliable sources and validated by experts, and tested for internal consistency and reliability through Cronbach's alpha. Hence, the reliability test and theoretical alignment were deemed adequate for the study purposes. Further research should consider using factor analysis and structural modeling for validating the construct

Table 3. Reliability coefficient for the three dimensions.

Construct	Number of Items	Cronbach's Alpha
Awareness of ICT-Enabled Digital Entrepreneurship	10	0.84
Motivations for ICT-Enabled Digital Entrepreneurship	10	0.83
Challenges of ICT-Enabled Digital Entrepreneurship	10	0.83

3. DATA COLLECTION

The required data were collected online using a Google Forms questionnaire and distributed via email to final-year students. The study gathered participants' demographic data, including gender, age, and major, to examine university students' awareness, motivations, and challenges. It also identified relationships and variations between males and females based on gender, age, and major. Since self-report data is used in the study, common method bias is a possibility. Nevertheless, procedural precautions such as ensuring anonymity, voluntariness, and proper item construction were implemented to minimize this risk.

4. DATA ANALYSIS

The collected numeric data were analyzed using descriptive and inferential statistics to assess pre-entrepreneurial orientation for ICT-enabled digital entrepreneurial initiatives. The research used descriptive statistics, including frequencies, percentages, means, and standard deviations, to depict university students' awareness, motivations, and challenges related to ICT use in DE. Based on demographic characteristics, inferential analyses, such as independent samples t-tests, ANOVA, and regression analyses, were also conducted to test correlations and differences in students' levels of awareness, motivations for ICT-enabled digital entrepreneurial activities, and challenges that hinder ICT-enabled DE. Given the study's diagnostic nature, descriptive statistics were prioritized to identify general awareness, motivations, and perceived challenges, whereas inferential analyses were conducted to examine associations, not predictive causality. Though SEM might have provided more in-depth insights into causality, it was not within the realm of the current diagnostic analysis, which emphasizes pattern recognition over causal structural relationships testing. Before carrying out regression analysis, statistical assumptions were tested. Diagnostics supported linearity, normality of residuals, and homoscedasticity, with no major violations observed. Satisfactory tolerance and VIF values indicated low multicollinearity. Due to the cross-sectional design, findings are interpreted as associational rather than causal.

IV. RESULTS

In light of the study objectives that aimed to investigate undergraduate students' level of awareness, motivational orientation, and anticipated challenges related to ICT-enabled DE, a questionnaire was conducted to explore the research questions. Descriptive and inferential analysis of 380 responses from four Omani government and private universities highlighted some significant results.

1. OMANI UNDERGRADUATES' AWARENESS ABOUT ICT-ENABLED DE

In Table 4, the highest mean value for the overall score of undergraduates' awareness is 3.85. Statistics highlight that students in Omani higher education institutions have a relatively good awareness of ICT-

enabled DE. The mean values for each item were generally between 3.21 and 4.09, suggesting a high level of generalized consensus. The statement "Using ICT for entrepreneurial purposes can save time and costs" received the highest level of approval (M = 4.09, SD = 0.88). This means students generally recognize the strategic significance of ICT-enabled DE. Items related to the role of ICT in promoting education and enhancing entrepreneurial skills both got higher scores (M = 4.08 and 4.07, respectively). The lower mean scores for "I am familiar with DE during my academic studies" (M = 3.29, SD = 1.02) and "I have adequate digital knowledge of using ICT to run digital start-ups" (M = 3.21, SD = 1.03) reveal gaps in students' exposure to real-world ICT applications in entrepreneurship and practical pre-entrepreneurial orientation. To conclude, despite the relatively high awareness score, the low results on items related to students' knowledge of digital start-ups and ICT practical competencies reveal varied levels of students' awareness.

Table 4. Undergraduate students' awareness of ICT's role in DE.

no	statement	Mean	Std. Deviation
9	I find that using ICT for entrepreneurship can save time and costs.	4.09	0.88
7	I realize that having ICT skills and entrepreneurial competencies contributes to developing digital entrepreneurship.	4.08	0.83
8	I realize that ICT usage optimizes my learning experience about DE.	4.07	0.86
6	I realize that participation in conferences, meetings and programs related to digital entrepreneurship development enhances my experience.	4.04	0.91
5	I realize that ICT tools are important supports for effective digital entrepreneurship.	4.03	0.84
3	I am aware that academic subjects (courses) in digital entrepreneurship are important for undergraduate students.	4.00	0.87
10	I realize that active engagement with external stakeholders prepares HEIs' students for future ICT-enabled digital careers.	3.87	0.89
1	I realize that the internet-based social media (ICT) is an important element of digital entrepreneurship.	3.83	0.90
2	I am familiar with digital entrepreneurship from my academic studies.	3.29	1.02
4	I have adequate digital knowledge of using ICT to run digital start-ups.	3.21	1.03
mean	3.85	0.58	

2. OMANI UNDERGRADUATES' MOTIVATIONS FOR ICT-ENABLED DE

Several driving motivations encourage undergraduates to embrace ICT in DE, as shown in Table 5. Students reflected a moderately positive attitude towards ICT-enabled DE initiatives, as seen in the overall mean score for motivation items of 3.77 (SD = 0.59). Despite consistency in motivational aspects, it somewhat varied with individual item means ranging from 3.60 to 3.93."The ease of creating new ventures is a motive for ICT-enabled DE" (M = 3.93, SD = 0.90) was the item with the highest rating due to perceived accessibility and ease. The perceived simplicity and accessibility that ICT offers in establishing digital businesses strongly motivate students. Likewise, digital security and autonomy also appeared to be key motivators. Moreover, safe protection systems (M = 3.88, SD = 0.97) and the sense of financial and personal freedom (M = 3.91, SD = 0.92) attracted students to DE. Students also confirmed the significance of the professional development aspect of ICT, reflecting that using ICT evolves communication skills (M = 3.87, SD = 0.94).

Although "My technological skills empower me to manage digital entrepreneurial ventures" (M = 3.60, SD = 0.91) and "Willingness to have challenges and tolerance of risk encourages me to ICT-enabled DE" (M = 3.63, SD = 0.92) were the lowest-rated, they stayed above the neutral point. This might imply relatively weaker confidence in students' technical abilities and entrepreneurial risk tolerance. Although positive motivational tendencies toward ICT-enabled DE were scored, these motivations could be consolidated

through instructional approaches that reinforce resilience, digital confidence, and self-efficacy in entrepreneurial settings.

Table 5. Undergraduate students' motivation to engage in ICT-Enabled DE.

no	statement	Mean	Std. Deviation
9	The ease of creating new ventures is a motive for ICT-enabled DE.	3.93	0.90
8	The feeling of personal and financial freedom stimulates me to ICT-enabled DE	3.91	0.92
10	Availability of a secure protection system from the risks of electronic threats consolidates ICT-enabled DE.	3.88	0.97
5	Using ICT for digital entrepreneurship develops students' communication skills.	3.87	0.94
3	Lack of governmental careers and financial dissatisfaction motivate me to have a positive view of ICT-enabled DE.	3.81	0.95
4	Perceived encouragement from family and peers increases my intention to engage in ICT-enabled DE.	3.70	0.95
6	Social influence (family, friends, media) motivates me to ICT-enabled DE.	3.69	0.91
1	ICT-enabled DE makes me feel independent and secure.	3.68	0.92
7	Willingness to have challenges and tolerance of risk encourage me to ICT-enabled DE.	3.63	0.92
2	My technological skills empower me to manage digital entrepreneurial ventures.	3.60	0.91
Mean		3.77	0.59

3. OMANI UNDERGRADUATES' PERCEIVED CHALLENGES OF ICT-ENABLED DE

According to Table 6, students have a relatively high perception of barriers related to the use of ICT in entrepreneurial contexts, as the average score was 3.82. This implies that students encounter challenges in business development as a result of both systemic and personal constraints. Item scores mean ranged from 3.57 to 4.00, reflecting a consensus among respondents on various constraints they face. The lack of capital (M = 4.00, SD = 0.90) and high ICT equipment costs (M = 3.95, SD = 0.87) were cited as two major barriers related to launching and maintaining digital businesses. Additionally, the lack of professional skills and experience (M = 3.94, SD = 0.89) is indicative of the limited practical implementation among students. This likely stems from a lack of exposure to real-life endeavors or experiential learning opportunities.

Further obstacle is digital financial illiteracy (M = 3.91, SD = 0.84), which hinders students' capacity to run digital start-ups effectively. Setbacks also came from institutional shortcomings: lack of institutional education on DE (M = 3.87, SD = 0.91), and insufficient training, which was supposed to cultivate digital entrepreneurial attitudes. These findings suggest some gaps in curriculum design and incompetent institutional support for developing digital entrepreneurial competencies. Laws received the lowest score (M = 3.57, SD = 1.06), but it was still above the midpoint. This leads to the conclusion that students are concerned about regulatory barriers but don't feel these are as pressing as financial and expertise-related limitations. Further studies still have to be conducted to determine if this notion is grounded in actual regulatory conditions or if it is simply the people's lack of awareness of the appropriate legal frameworks for DE development. Noteworthy that the items concerning technological self-efficacy and risk tolerance yielded the lowest mean scores, signifying possible limitations regarding students' involvement in their entrepreneurship.

Table 6. Undergraduate students' anticipated challenges in Using ICT for DE.

no	statement	Mean	Std. Deviation
7	Lack of financial resources impedes some entrepreneurs from starting digital entrepreneurship.	4.00	0.90
9	The high costs of ICT gadgets limit the implementation of ICT-enabled DE	3.95	0.87
4	The lack of students' experience and professional skills for starting digital entrepreneurship.	3.94	0.89
8	Digital financial illiteracy delays the digitization of some ventures.	3.91	0.84
3	Lack of formal education in DE can limit the acquisition of digital entrepreneurial skills	3.87	0.91
2	lack of training to acquire the attitude of ICT-enabled DE.	3.80	0.93
5	Technical and technological infrastructure limit the ICT-enabled DE.	3.78	0.94
10	Lack of policies and regulations that protect and support digital entrepreneurship.	3.70	1.02
1	Lack of awareness of digital services.	3.66	1.01
6	Laws, regulations and legislation restrict the adoption of ICT in digital entrepreneurship.	3.57	1.06
mean		3.82	0.59

4. GENDER DIFFERENCES IN OMANI UNDERGRADUATES' AWARENESS, MOTIVATION, AND CHALLENGES ABOUT ICT-ENABLED DE

The T-test analysis in Table 7 demonstrates significant gender differences in the awareness level and motivations for ICT-enabled DE, with females scoring higher (awareness: 3.96 vs. 3.71; motivation: 3.88 vs. 3.63, $p < 0.001$). This implies that females are more likely to engage in ICT-enabled DE. No observable difference was found in the perceived difficulties between males (3.78) and females (3.85), indicating that the obstacles faced by both groups were comparable.

Table 7. Gender-Based differences in awareness, motivations, and challenges of ICT-Enabled DE.

Gender	Gender	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
awareness	Male	168	3.71	0.68	4.35	378	0.000
	Female	212	3.96	0.46			
motivations	Male	168	3.63	0.68	4.18	378	0.000
	Female	212	3.88	0.47			
challenges	Male	168	3.78	0.68	1.26	378	0.209
	Female	212	3.85	0.50			

5. AGE-BASED VARIATIONS IN AWARENESS, MOTIVATIONS, AND PERCEIVED CHALLENGES OF ICT-ENABLED DE

ANOVA analysis in Table 8 displays no statistically significant differences between age groups in their perceptions of the challenges ($F = 0.98$, $p = 0.378$) or awareness of ICT-enabled DE ($F = 0.59$, $p = 0.558$). These values exceed the conventional significance level of 0.05, explaining that students, regardless of age, share similar levels of awareness and comparable barriers when engaging with ICT in entrepreneurial contexts.

Nonetheless, motivational factors varied statistically significantly between age groups (F = 3.19, p = 0.042). According to these findings, students' reasons for ICT-enabled DE differ depending on their ages.

Table 8. Age-Based differences in awareness, motivations, and perceived challenges related to ICT-Enabled DE.

Dependent Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
awareness	Between Groups	0.40	2	0.20	0.59	0.558
	Within Groups	127.97	377	0.34		
motivations	Between Groups	2.17	2	1.09	3.19	0.042
	Within Groups	128.21	377	0.34		
challenges	Between Groups	0.67	2	0.34	0.98	0.378
	Within Groups	129.85	377	0.34		

With a mean difference of -0.22 ($p < 0.05$), there is only a statistically significant difference in motivation towards ICT-enabled DE between students aged 20–23 and those over 27, as shown by the LSD post-hoc test. Younger students were noticeably less motivated than their older counterparts. The motivational gap was greatest between the youngest and oldest age groups, as no significant differences were found between the adjacent age groups (20–23 vs. 24–27 and 24–27 vs. those above 27).

Table 9. LSD post-Hoc test for Age-Based differences in motivation toward ICT-Enabled DE.

	Age		Mean Difference (I-J)
motivations	20-23	24-27	-0.12
		Above 27	-.22*
	24-27	Above 27	-0.10

6. MAJOR-BASED DIFFERENCES IN ICT-ENABLED DE AMONG OMANI UNDERGRADUATES

According to Table 10, students from various specializations do not differ statistically significantly in their perceptions of challenges (F = 1.92, p = 0.126), motivations (F = 1.48, p = 0.219), or awareness of ICT-enabled DE (F = 1.67, p = 0.172). All p-values are greater than the conventional significance level of 0.05. Undergraduates, irrespective of their areas of expertise, demonstrate comparable awareness levels, share similar motivational factors, and encounter the same difficulties when implementing ICT in entrepreneurial settings.

Table 10. One-Way ANOVA results for major-based differences in awareness, motivations, and perceived challenges related to ICT-Enabled DE.

Dependent Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
awareness	Between Groups	1.69	3	0.56	1.67	0.172
	Within Groups	126.68	376	0.34		
motivations	Between Groups	1.52	3	0.51	1.48	0.219
	Within Groups	128.85	376	0.34		

challenges	Between Groups	1.97	3	0.66	1.92	0.126
	Within Groups	128.55	376	0.34		

7. ASSOCIATION BETWEEN AWARENESS AND MOTIVATION TOWARD ICT-ENABLED DE

Significant relationship of students' awareness of ICT-enabled DE and their motivation to use ICT (t = 16.99, p <.001) is presented in Table 11. Based on the standardized beta value (β = 0.66), there is a strong positive predictive correlation between the two variables. 43% of the variation in motivation can be explained by students' awareness, according to an R-squared of 0.43. This means that higher awareness encourages a strong desire to engage in ICT-enabled DE.

Table 11. Regression coefficients of awareness on students' motivation toward ICT-Enabled DE.

Predictor	B	SE	β	t	Sig.	r	R^2
(Constant)	1.22	0.15		8.00	< .001	0.66	0.43
Awareness	0.66	0.04	0.66	16.99	< .001		

Note. B = unstandardized coefficient; β = standardized beta.

8. ASSOCIATION BETWEEN AWARENESS AND PERCEPTIONS OF CHALLENGES

The regression analysis in Table 12 reveals a statistically significant relationship between students' awareness of ICT-enabled DE and their perceptions of challenges in ICT-enabled DE (t = 7.40, p < .001). 13% of the variance in perceived challenges was (R^2 = 0.13), showing a modest but meaningful association. The positive unstandardized coefficient (B = 0.36) illustrates that higher awareness was associated with higher perceived challenges. It may reflect a greater sensitivity among more aware students to the complexity and barriers in ICT-enabled DE.

Table 12. Regression coefficients of awareness on perceived challenges in ICT-Enabled DE.

Predictor	B	SE	β	t	p	r	R^2
Constant	2.44	0.19		12.91	< .001		
Awareness	0.36	0.05	0.36	7.40	< .001	0.36	0.13

Note. B = unstandardized coefficient; β = standardized beta.

9. ASSOCIATION BETWEEN MOTIVATIONS AND PERCEPTIONS OF CHALLENGES

Table 13 indicates that students' motivation is significantly related to their perception of the challenges of ICT-enabled DE (t = 7.96, p <.001). The regression model explained 14% of the variance in perceived challenges (R^2 = 0.14), showing a modest but meaningful predictive statistical linkage. Its positive unstandardized coefficient (B = 0.38) demonstrates that higher students' motivation was associated with higher perceived challenges. Thus, it can be inferred that more motivated students may be more aware of potential barriers. This is likely due to their intensive involvement and analytical reflection on the entrepreneurial process.

Table 13. Regression coefficients of motivation on perceived challenges in ICT-Enabled DE.

Predictor	B	SE	β	t	p	r	R^2
Constant	2.32	0.18		12.64	< .001		
Motivation	0.38	0.05	0.38	7.96	< .001	0.38	0.14

Note. B = unstandardized coefficient; β = standardized beta

V. DISCUSSION

Omani final-year undergraduates (prospective digital entrepreneurs) were sampled to measure their knowledge, awareness, and motivation, as well as the challenges of involvement in ICT-enabled DE. This study is regarded as a diagnostic examination of undergraduates' awareness, motivational orientation, and challenges for ICT-enabled DE rather than an explanatory or predictive study. The average scores across all measurement items suggested a common perception that pre-entrepreneurial orientation for DE is generally homogeneous in higher education at this stage. Despite structural and financial limitations to successful ICT-enabled DE, findings from this study demonstrated high awareness and moderate to high motivation.

Students' awareness was relatively high (M = 3.85), reflecting that ICT is a strategic tool for DE, particularly in boosting productivity and reducing costs. Despite the high overall results, an examination of the scores for individual items identified critical shortcomings in students' awareness. More specifically, the lowest mean values were observed for items related to start-up knowledge for digital ventures and overall confidence in applying ICT to the running of ventures. These findings indicate that the overall awareness level of the importance of ICT in the DE context remains conceptual rather than operational. These are certainly critical outcomes and constitute a significant contribution of the present research. Moreover, students acknowledged ICT's role in promoting learning experiences and entrepreneurial skills. These outcomes are consistent with [74], which confirmed that digital technologies have a positive influence on the entrepreneurial intentions of university students. [5] highlighted that entrepreneurship education fosters entrepreneurial orientation, competencies, autonomy, proactivity, and innovation. Furthermore, students' attitudes toward the social value of entrepreneurship are shaped by exposure to successful entrepreneurial role models [75].

Given students' lower levels of digital start-up competencies and practical knowledge, their awareness may remain primarily conceptual. This suggests a gap between theoretical understanding and practical application within higher education curricula. [6] explained that experiential learning significantly improves entrepreneurial intention, competencies, and the teaching-learning process; therefore, [74, 76] have urged for integrating DE training into educational programs. [75] proposed that entrepreneurship education should be tailored differently for business and non-business students because exposure to entrepreneurial success stories affects each group differently. [77] provided further evidence that entrepreneurship education significantly improves students' chances of becoming digital entrepreneurs.

High levels of student motivation for ICT-enabled DE have been identified. Key motivations include the financial freedom and independence that DE offers, as well as the perceived simplicity of launching online businesses. Autonomy, independence, opportunity, and personal and economic benefits were also recognized as factors that affect students' motivation to adopt ICT in DE [50, 77]. Lower levels of technological proficiency and risk-taking tendencies indicated issues with self-confidence and resilience. While moderate to high levels of motivation for ICT-enabled DE were uncovered, the lowest-rated items related to technological self-efficacy and risk tolerance carry considerably more significance than the higher-rated motivational factors. Students' perceptions of their confidence in managing successful digital ventures, as well as their preparedness to cope with uncertainties, suggest that motivation might not be adequate on its own without support that encourages digital capabilities and entrepreneurial resilience. Additionally, the results also showed that students' motivation is constrained by their perception of self-capability rather than interest. These findings are consistent with the research of [51, 78], which shows that risk tolerance is a strong predictor of entrepreneurial intentions. Therefore, these results underscore the importance of encouraging innovation and entrepreneurship education to enhance students' ability to undertake innovative and risk-taking activities. Further, the adoption of pedagogical interventions to enhance students' technological and entrepreneurial capabilities, particularly those related to risk-taking and challenges, may be critical.

Financial constraints and the high price of ICT hardware were the biggest obstacles to the successful implementation of ICT-enabled DE (Mean = 3.82). Although financial and infrastructural limitations rated the highest, the absence of professional skills, digital financial literacy, and training was indicative of significant underlying issues in pre-entrepreneurial orientation. These challenges, which indicate lower competencies, supported the inference that a lack of practical and experiential awareness and preparation

limited students' active participation in DE more than attitudinal resistance. Disadvantages like high ICT costs, limited digital infrastructure, and inadequate technological support systems continued to impede students' active participation in digital entrepreneurship [80, 79]. Regulations and laws scored the lowest mean and remained a significant hindrance. As evident in the Brazilian and Russian settings, participants felt that better laws and policies could improve digital accessibility and facilitate the development of fintech growth [81, 82].

Gender-based differences in ICT use for DE were observed through a demographic analysis of students. Females showed greater awareness (Mean = 3.96) and motivation (Mean = 3.88) for ICT-enabled DE than did males (Mean = 3.71 and Mean = 3.63, respectively), indicating a stronger inclination among females toward ICT-enabled DE. This finding aligns with global trends, which emphasize the growing number of women involved in entrepreneurship [50]. However, no gender differences were noted in the perceived challenges associated with using ICT for entrepreneurial purposes (Mean = 3.78 for males and Mean = 3.85 for females), indicating that both genders face similar barriers when attempting to use ICT for entrepreneurial purposes.

Although no age-based observable differences were found among age groups of students in terms of awareness of ICT-enabled DE and perceived barriers, the motivational factors differed considerably, as age affects the students' motivations for ICT-enabled DE. It is pertinent to note that, despite older students reflecting the highest level of motivation due to their higher maturity levels, a clearer career path, and more exposure to the real world, the youngest students demonstrated the lowest level of motivation. This finding is contrary to other research works, which demonstrated that young people tend to retain a stronger intention and desire for DE and technology adoption [83, 84]. Regardless of students' majors, there were no statistical differences in student awareness, motivation, or perceived obstacles to using ICT-enabled DE. Undergraduates showed similar levels of awareness, common motivational factors, and similar challenges regardless of their majors.

Correlation analyses show a strong positive relationship between students' awareness of ICT adoption in DE and their motivation. This suggests that students who are more aware of the significance of ICT in DE are more motivated to engage in DE activities. Moreover, awareness and perceived challenges are positively correlated, indicating that higher awareness tends to make students more adaptable to DE challenges. The strong relationship between motivation and perceived challenges suggests that more motivated students are also more aware of potential barriers, more involved, and may be better able to overcome obstacles, possibly due to deeper involvement and critical reflection on the entrepreneurial process. Awareness, motivation, and perceptions of challenges should not be viewed as discouragement but as a level of cognitive sophistication. Therefore, students with higher levels of awareness and motivational orientation tend to adopt a more analytical approach to the realities of DE, making them more sensitive to challenges. In other words, a deeper level of understanding does not diminish but instead reveals the difficulty of pursuing entrepreneurship. This can be explained by research on entrepreneurship learning, which suggests that informed individuals tend to have a more realistic perception of risk and constraints, which can be attributed to deeper engagement rather than lower orientation [6, 83].

The post hoc examination of scale items also suggested areas for improving face validity in future work. Certain items related to normative and achievement motivation would be theoretically better specified to distinguish adequately between subjective norms, social support, and personal achievement orientation. Although these items have demonstrated acceptable reliability in the present research, future development of the instrument should be more rigorous in its focus on precise language and construct separation to enhance measurement validity for pre-DE-related research. The theoretical contribution of this study is to provide evidence on the utility of TPB as a sensitizing framework for exploring pre-entrepreneurial orientation in HEIs. It is not the overall TPB model that is being tested, but rather how the interplay of attitudinal awareness, perceived behavioral control, and motivational orientation occurs at an earlier, pre-intentional stage of DE development. The results generalized TPB's usefulness to pre-entrepreneurs and pointed out its diagnostic value in identifying preparatory gaps before market entry.

Several practical implications for higher education institutions' policies and curriculum design were suggested through the study findings. For instance, the universities should employ entrepreneurship

programs that include practical DE labs, mentorships, and digital financial literacy. Internship and incubators can bridge the gap between conceptual awareness and pre-entrepreneurial orientation. Moreover, the collaboration with governmental innovation institutions helps in supporting entrepreneurship and accessibility to digital tools.

The current research study makes valuable theoretical contribution to the literature on digital entrepreneurship and entrepreneurship education, especially in emerging economies context.

Firstly, the study adds to the understanding of pre-entrepreneurial orientation by moving beyond intention-based approaches to pre-intentional constructs. Whereas prior research has mainly used the Theory of Planned Behavior (TPB), this research shows that awareness, motivational orientation, and perception of challenges can work independently as pre-intentional factors influencing orientation to pursue entrepreneurship intentions. Secondly, the study adds to the TPB construct by viewing it as a sensitizing framework to understand pre-entrepreneurial development rather than a predictive framework assuming causal relationships. It shows the presence of TPB constructs in entrepreneurial thinking at an early developmental stage.

Third, this research suggests a perceptual diagnosis model based on awareness, motivation, and challenge as coexisting, interrelated, and complementary factors, rather than causally linked variables, offering a different framework for understanding entrepreneurship positioning in educational contexts. Fourth, the empirical recognition of the gap between high awareness and low orientation contributes to entrepreneurship education literature by highlighting the difference between conceptual knowledge and operational inclination. Lastly, this research fills a gap in digital entrepreneurship literature in emerging economies, especially in Oman, by providing an empirical framework for evaluating students' orientation to engage in entrepreneurial activities through ICTs and supporting future theory development.

From a methodological perspective, this paper offers contributions through the design of a diagnostic scale for the evaluation of pre-entrepreneurial awareness and preparedness using a structured survey instrument. This highlights the feasibility of descriptive-inferential analysis in measuring the early entrepreneurial mindset within university settings, especially in developing countries

VI. CONCLUSION

This research advances entrepreneurship education by providing a diagnostic assessment of undergraduates' awareness, motivational orientation, and perceived challenges regarding ICT-enabled DE in an emerging economy context. The findings reveal strong conceptual awareness but comparatively weaker confidence in practical entrepreneurial skills, indicating a gap between understanding digital entrepreneurship and feeling capable of implementing it. Rather than examining entrepreneurial outcomes, this research highlights gaps between theoretical awareness and practical implementation before entering the labor market. This diagnostic study establishes a baseline by presenting an overview of undergraduate students' awareness of ICT-enabled DE, revealing prevailing levels of awareness, motivational tendencies, and perceived challenges. Although a high level of awareness (M = 3.85) of ICT's role in enhancing learning and entrepreneurial skills was observed, a gap in knowledge of running digital start-ups remained.

Students are moderately motivated towards using ICT-enabled DE, mainly due to the perceived ease of launching ventures and feelings of autonomy and financial independence. Whereas financial limitations, lack of resources, and high costs of ICT were the primary constraints, regulatory issues were perceived as less significant challenges. Though both genders faced similar problems, female students were more aware of and motivated by ICT-enabled DE. Older students (above 27) were more motivated, and there were no statistically significant differences in awareness and perceived challenges by age groups. In addition, no variations were recorded by academic discipline. Notably, the value of the study lay not in the levels of awareness and motivation attained but in the lower levels of practical skills, confidence, and risk-taking ability. This emphasizes the importance of developing capacities in DE education to go beyond raising awareness programs.

Omani academic institutions and policymakers are expected to incorporate financial literacy and experiential DE education into curricula. Raising awareness alone is insufficient; opportunities for real-world application are needed to narrow the knowledge gap and prepare people. Strengthening collaboration among government, industry, and academic institutions could further support ICT-enabled entrepreneurship and innovation.

The study's scope was limited to four universities; thus, future research could broaden institutional coverage, adopt longitudinal approaches, and conduct comparative analyses with other GCC countries. Although this instrument has shown good reliability in its results, a post hoc conceptual review underscores the need to further validate this scale, particularly through Confirmatory Factor Analysis of the items, as well as the modification of some test items.

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Author Contributions

Conceptualization, R.K.A.-M.; methodology, R.K.A.-M., A.M.S.; software, N.H.A.H.; validation, R.K.A.-M., A.M.S., N.H.A.H.; formal analysis, R.K.A.-M.; investigation, A.M.S., N.H.A.H.; resources, A.M.S.; data curation, N.H.A.H.; writing—original draft preparation, R.K.A.-M.; writing—review and editing, A.M.S., N.H.A.H.; visualization, N.H.A.H.; supervision, R.K.A.-M.; project administration, R.K.A.-M., A.M.S.; funding acquisition, R.K.A.-M., A.M.S., N.H.A.H.

Conflict of Interest

The authors declare that there is no conflict of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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Ethical Approval and Informed Consent Statements

Official facilitation letter issued by University 1, University 2, and University 3 to support the researcher in conducting data collection. Therefore, it does not contain a review board name or an ethical approval number. Ethical approval for this study was obtained from the Research Ethics Committee, Research Ethics & Biosafety Committee (UREBC), University 4. The approval number ASU/UREBC/24/13 was released on June 6, 2024. Informed consent was written and obtained electronically from all participants before data collection. The researcher indicated that the survey inquiries will take 10 minutes, bearing in mind that the results will only be used for scientific research. The participation in this study is completely voluntary, and the participants may choose not to participate or withdraw at any time without any penalty or negative consequences. The researcher also demonstrated that there are no foreseeable risks associated with participation in this study beyond those encountered in everyday academic activities. All information provided in this questionnaire will be treated with strict confidentiality.

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