

Entrepreneurial Intention, Digital Leadership, and Willingness to Change in Technology-Based SMEs: A Saudi Vision 2030 Perspective

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Received: 07/01/2026

Revised: 09/05/2026

Accepted: 20/05/2026

Abstract

This research examines the relationships among entrepreneurial intention, willingness to change, digital leadership, and digital entrepreneurship in the context of small and medium-sized enterprises (SMEs) in Saudi Arabia, situated within the Saudi Vision 2030 national transformation agenda. A quantitative approach was adopted, involving a survey of 149 managers drawn from a sampling frame of 349 technology-based SMEs in Saudi Arabia. A structured questionnaire was used, with scales adapted from prior research to ensure reliability and validity. Data were analyzed using Stata-SEM to assess the hypothesized relationships among the constructs. The findings reveal that entrepreneurial intention significantly influences technology-based enterprise development ($b = 0.333$, $z = 2.265$, $p = 0.024$), with willingness to change serving as a crucial mediator in this relationship ($b = 0.454$, $z = 4.039$, $p < 0.001$). Additionally, digital leadership ($b = 0.437$, $z = 4.461$, $p < 0.001$) and digital entrepreneurship ($b = 0.286$, $z = 1.958$, $p = 0.050$) were found to significantly moderate the relationship between entrepreneurial intention and enterprise development, with digital leadership exerting the stronger moderating effect. This research contributes to the existing literature on entrepreneurship by providing empirical evidence of the interrelated nature of these constructs in a rapidly evolving digital landscape, while offering practical insights for entrepreneurs, organizational leaders, and Vision 2030 policymakers seeking to foster innovation and adaptability within SMEs.

Keywords: Entrepreneurial Intention, Technology-Based Enterprises Development, Willingness to Change, Digital Entrepreneurship, Digital Leadership

1. Introduction

The accelerating pace of digital transformation has fundamentally reshaped how firms create value, compete, and sustain growth, positioning technology-based entrepreneurship at the core of the modern economy (Nguyen & Nguyen, 2024). Small and medium-sized enterprises (SMEs) are widely recognized as key drivers of innovation, job creation, and technological diffusion, particularly in economies undergoing structural transformation (Yanez-Valdes & Guerrero, 2024). However, in digitally intensive environments, technology-based SMEs face increasing uncertainty, rapid technological change, and shorter product life cycles (Chen et al., 2024). As a result, the successful development of such enterprises depends not only on innovation but also on entrepreneurial motivation, adaptability, and digital capabilities.

Entrepreneurial intention is widely regarded as a fundamental antecedent of entrepreneurial behavior and venture creation. Rooted in the Theory of Planned Behavior, it

reflects an individual's motivation and commitment to pursue entrepreneurial activities and has been linked to opportunity recognition, risk-taking, and venture formation across contexts (Khurniawan & Irmawaty, 2024). In technology-driven industries, where innovation and strategic foresight are critical, entrepreneurial intention plays a particularly important role (Destrian & Sudarma, 2024). Nevertheless, emerging evidence suggests that entrepreneurial intention alone is insufficient to ensure enterprise success in dynamic digital environments. Many technology-oriented ventures fail not due to lack of intention, but because of limited adaptability and ineffective responses to change (Zulfitri & Sari, 2024).

This intention–performance gap is especially relevant in developing digital economies such as Saudi Arabia (Indriastuti & Fachrunnisa, 2024; Sandhi et al., 2024). Under Saudi Vision 2030, the Kingdom has launched an ambitious transformation agenda aimed at diversifying the economy, reducing reliance on oil, and fostering a digitally driven entrepreneurial ecosystem (Faghih, 2024). Technology-based SMEs are central to this vision, supported by investments in digital infrastructure, regulatory reforms, and entrepreneurship development programs (Anwar, 2024). At the same time, the institutional context of Saudi SMEs is characterized by centralized decision-making, evolving organizational practices, and a rapid shift toward digital business models. These factors influence how entrepreneurial intention is translated into enterprise outcomes.

In this context, willingness to change becomes a critical behavioral factor. It reflects an individual's openness to adapting strategies, processes, and technologies in response to environmental uncertainty (Anwar et al., 2015). In technology-based SMEs, particularly within the Saudi context, willingness to change enables entrepreneurs to align their actions with ongoing digital transformation and organizational change requirements (Sabaruddin et al., 2024). Entrepreneurs who resist change may fail to capitalize on emerging opportunities, whereas those who combine strong intention with adaptability are more likely to achieve sustainable growth (Xia et al., 2024).

Beyond individual adaptability, organizational-level digital capabilities also play a crucial role in shaping entrepreneurial outcomes. Digital leadership, defined as the ability to leverage digital technologies, data-driven decision-making, and innovation-oriented cultures, is particularly important in digitally transforming environments (Choi et al., 2024). In Saudi SMEs, where leadership is often centralized among founders or senior managers, digital leadership directly influences how effectively entrepreneurial intentions are translated into practice (Lukita et al., 2023). Leaders with strong digital competencies can facilitate innovation, guide strategic decisions, and support the adoption of new technologies.

Similarly, digital entrepreneurship provides the structural and operational capacity necessary to transform entrepreneurial intention into viable enterprises. It involves the strategic use of digital platforms, technologies, and ecosystems to create and scale new ventures. By enabling access to broader markets, enhancing operational efficiency, and supporting innovation, digital entrepreneurship strengthens the link between intention and enterprise development in technology-driven sectors.

Despite the growing importance of these factors, existing research remains limited in its ability to explain entrepreneurial processes within rapidly evolving digital environments such as Saudi Arabia (Prameka & Kurniawan, 2023). Most studies examine entrepreneurial intention, willingness to change, digital leadership, and digital entrepreneurship in isolation or within Western or generalized emerging economy contexts. Consequently, there is limited understanding of how these factors interact within a state-driven digital transformation agenda like Vision 2030 (Abd Rahim et al., 2023).

More importantly, no prior study has integrated these four constructs into a single empirical model within the Saudi context. This gap highlights the need for research that combines motivational, behavioral, and capability-based perspectives to better explain

technology-based enterprise development. Addressing this gap is essential for understanding how entrepreneurial intention can be effectively translated into enterprise outcomes in digitally transforming environments.

To address this limitation, the present study develops and empirically tests an integrative model linking entrepreneurial intention to technology-based enterprise development, with willingness to change as a mediating variable and digital leadership and digital entrepreneurship as moderating factors (Adhiatma et al., 2023). Using data collected from founders and senior managers of Saudi technology-based SMEs, this study contributes to the entrepreneurship literature by contextualizing entrepreneurial processes within a rapidly digitalizing and institutionally specific environment (Jafari-Sadeghi et al., 2023).

From a practical perspective, the findings offer valuable insights for entrepreneurs, policymakers, and business leaders seeking to strengthen the technology-driven SME sector in alignment with Vision 2030. By identifying the key factors that influence enterprise development, this study provides guidance for enhancing entrepreneurial performance in digital economies.

This study is guided by the following research questions: (RQ1) Does entrepreneurial intention significantly influence technology-based enterprise development in Saudi SMEs? (RQ2) Does willingness to change mediate this relationship? (RQ3) Does digital leadership moderate the relationship between entrepreneurial intention and enterprise development? and (RQ4) Does digital entrepreneurship moderate this relationship?

2. Literature Review

Entrepreneurial intention is widely recognized as a central determinant in understanding the decision-making process through which individuals choose to pursue entrepreneurial ventures (Malodia et al., 2023). Theoretical frameworks such as the Theory of Planned Behavior (TPB) have been extensively applied to explain how attitudes, subjective norms, and perceived behavioral control shape the intention to start a business (Zhai et al., 2023). Attitudes toward entrepreneurship significantly influence how individuals perceive the attractiveness and feasibility of entrepreneurial careers. Positive attitudes—such as the desire for autonomy, financial rewards, and societal contribution—have been identified as major drivers of entrepreneurial pursuits (Anoraga et al., 2023).

Subjective norms, including social pressure, family support, and exposure to entrepreneurial role models, further influence the strength of entrepreneurial intentions (Abd Rahim et al., 2023). Meanwhile, perceived behavioral control—reflecting individuals' confidence in their ability to perform entrepreneurial tasks—plays a critical role in determining whether intentions are translated into action (Chotipurk et al., 2023). Beyond individual factors, external conditions such as educational environments, government policies, and cultural contexts significantly shape entrepreneurial intentions. Universities and training institutions contribute by equipping individuals with knowledge, skills, and networks necessary for entrepreneurial success (Dutta Gupta & Guha Majumder, 2023). Entrepreneurial education enhances intention by increasing self-efficacy and reducing perceived risk.

Socio-cultural context also plays a crucial role. In societies where entrepreneurship is valued, individuals are more likely to consider it a viable career path. Conversely, in contexts where failure is stigmatized, psychological barriers may suppress entrepreneurial intentions (Ur Rehman et al., 2024). This highlights that entrepreneurial intention is shaped by the interaction of individual, social, and environmental factors, requiring multifaceted approaches to foster entrepreneurship.

Entrepreneurial intention refers to a cognitive state that precedes and directs the process of venture creation (Abidin, 2023). It is influenced by perceived opportunities, risk tolerance, and self-efficacy (Fachrurazi, 2023). In contrast, technology-based enterprise development

involves the creation and growth of businesses grounded in innovation and emerging technologies (Oliveira & Trento, 2023). These enterprises are typically found in sectors such as software, telecommunications, and biotechnology, which require specialized knowledge (Fahmi & Savira, 2023). Their success depends on the entrepreneur's ability to leverage technology, introduce innovation, and respond to market demands (Yanamandra & Indiran, 2023).

Entrepreneurial intention serves as a key antecedent of technology-based enterprise development by motivating individuals to identify opportunities, manage risks, and drive innovation in dynamic environments (Koivusalo, 2023). Empirical studies consistently show a positive relationship between entrepreneurial intention and technology-based entrepreneurship (Troise et al., 2022). Individuals with strong intentions are more likely to engage in opportunity recognition and innovation activities, particularly in high-tech industries (Primario et al., 2022). They are also more inclined to pursue ventures requiring specialized expertise (Upadhyay et al., 2022).

Entrepreneurial education further strengthens this relationship by developing innovation-oriented skills (Khan, 2022). Individuals with high entrepreneurial intention are better prepared to succeed in technology-driven markets due to stronger strategic vision, problem-solving abilities, and risk tolerance (Steininger et al., 2022). These capabilities are essential in navigating the complexities of technology-based industries (Soetjipto et al., 2022). Therefore, it is reasonable to hypothesize that entrepreneurial intention significantly contributes to the development of technology-based enterprises (Yopan et al., 2022). While prior studies have often examined entrepreneurial intention in isolation (Malodia et al., 2023), the present study situates this relationship within the Vision 2030 context, where institutional support plays a crucial role.

H1. Entrepreneurial intention significantly influences the development of technology-based enterprises.

Recent research emphasizes willingness to change as a critical mediator in entrepreneurial processes, particularly in innovative industries (Nguyen & Nguyen, 2024). Willingness to change refers to an individual's openness to new ideas and readiness to adapt to changing conditions (Chen et al., 2024). It is associated with adaptability and innovation, both of which are essential in rapidly evolving technological environments (Khurniawan & Irmawaty, 2024).

Entrepreneurs with high willingness to change are more likely to adjust strategies, adopt new technologies, and pivot business models to remain competitive (Sandhi et al., 2024). This adaptability enables them to exploit technological opportunities and navigate uncertainty, which is critical for the success of high-tech ventures (Zulfitri & Sari, 2024). Adaptability also facilitates innovation by allowing entrepreneurs to refine processes and identify alternative solutions (Satar et al., 2024).

Moreover, willingness to change reduces the risk of relying on outdated practices and enhances alignment with market dynamics (Huang et al., 2024). This mediating role suggests that entrepreneurial intention alone is insufficient; instead, it must be complemented by adaptability to produce successful outcomes (Bilgiseven, 2024). In technology-intensive sectors characterized by rapid change, the ability to adapt is essential for sustaining competitiveness (Prameka & Kurniawan, 2023).

Thus, willingness to change acts as a behavioral mechanism that translates entrepreneurial intention into performance outcomes (Lukita et al., 2023). Entrepreneurs who embrace change are more likely to experiment with new technologies and respond effectively to market signals (Malodia et al., 2023). While prior studies confirm its positive role, this study extends the literature by examining its mediating function within the Saudi SME context.

H2. Willingness to change significantly mediates the relationship between entrepreneurial intention and the development of technology-based enterprises.

Digital leadership has emerged as a crucial factor in the success of technology-based enterprises (Chotipurk et al., 2023). It refers to the ability of leaders to leverage digital technologies, data, and innovation strategies to guide organizations in the digital economy (Hindrawati et al., 2023). Digital leadership enhances organizational agility, innovation, and strategic alignment.

Empirical studies indicate that digitally competent leaders foster innovation-oriented cultures and improve firm performance (Fachrurazi, 2023). They enable data-driven decision-making and facilitate timely responses to market changes (Schiuma et al., 2021). Firms with strong digital leadership demonstrate higher innovation capabilities, particularly in technology-intensive industries (Fahmi & Savira, 2023).

Digital leadership also moderates the relationship between entrepreneurial intention and enterprise development by enhancing the entrepreneur's ability to execute strategies (Koivusalo, 2023). While intention motivates venture creation, leadership capabilities determine the success of implementation (Primario et al., 2022). Effective digital leaders can navigate technological disruptions, identify opportunities, and implement innovation strategies (Yopan et al., 2022).

In the Saudi context, where leadership structures are often centralized, digital leadership plays a critical role in shaping organizational outcomes (Destrian & Sudarma, 2024). Leaders' competencies directly influence digital adoption and innovation processes. Therefore, digital leadership strengthens the impact of entrepreneurial intention on enterprise development.

H3. Digital leadership significantly moderates the relationship between entrepreneurial intention and the development of technology-based enterprises.

Digital entrepreneurship is another important factor influencing technology-based enterprise success (Yanez-Valdes & Guerrero, 2024). It involves the use of digital technologies and platforms to create, manage, and grow businesses (Duong et al., 2024). Digital transformation has expanded opportunities for entrepreneurs by reducing entry barriers and enabling global market access.

Digital entrepreneurship enhances innovation, scalability, and efficiency by providing access to digital ecosystems and resources (Khurniawan & Irmawaty, 2024). Entrepreneurs leveraging digital tools can adapt more quickly and create value through new business models (Indriastuti & Fachrunnisa, 2024). These capabilities are particularly important in technology-driven industries.

As a moderating factor, digital entrepreneurship strengthens the relationship between entrepreneurial intention and enterprise development by enabling the operationalization of entrepreneurial ideas (Faghih, 2024). Access to digital platforms facilitates collaboration and accelerates business growth (Choi et al., 2024). Empirical evidence suggests that integrating digital tools with entrepreneurial activities improves innovation and competitiveness (Sabaruddin et al., 2024).

Entrepreneurs with strong digital capabilities are better positioned to succeed in technology-based ventures (Jafari-Sadeghi et al., 2023). Digital entrepreneurship allows them to explore new markets, adopt innovative models, and maintain competitive advantage (Zhai et al., 2023). While digital leadership focuses on internal capabilities, digital entrepreneurship reflects external engagement with digital ecosystems.

H4. Digital entrepreneurship significantly moderates the relationship between entrepreneurial intention and the development of technology-based enterprises.

Theoretical Framework / Conceptual Integration

This study adopts an integrative framework combining motivational, behavioral, and capability-based perspectives to explain technology-based enterprise development in digital SME contexts. Rather than relying on a single theory, it conceptualizes entrepreneurship as a process in which intention initiates action, adaptability enables execution, and digital capabilities determine outcomes.

At the individual level, the framework is grounded in the Theory of Planned Behavior (Ajzen, 1991), which identifies intention as the primary predictor of behavior. In entrepreneurship, intention drives opportunity recognition and venture creation. However, TPB does not fully explain how intention leads to sustained performance in dynamic environments. To address this limitation, willingness to change is introduced as a mediating mechanism that links intention to action. It represents adaptability and the ability to respond to uncertainty through continuous learning and innovation. This behavioral dimension is essential in technology-driven contexts where rapid change is constant.

At the organizational level, the framework incorporates the Resource-Based View (Barney, 2001), which emphasizes the role of strategic resources in firm performance. Digital leadership and digital entrepreneurship are conceptualized as key resources that enhance entrepreneurial outcomes. Digital leadership reflects internal capabilities related to decision-making and innovation, while digital entrepreneurship represents external engagement with digital ecosystems.

Together, these elements create a multi-level framework in which entrepreneurial intention provides motivation, willingness to change enables action, and digital capabilities shape outcomes. This integrated approach offers a comprehensive understanding of how technology-based enterprises are developed in the digital economy.

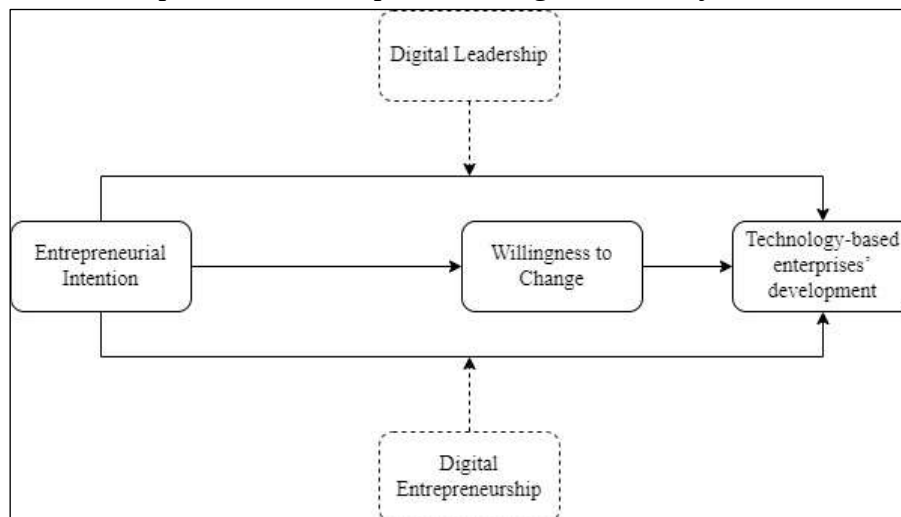


Figure 1: Theoretical Model

3. Research Objectives

The purpose of study is guided by the following explicitly stated objectives, each traceable to the corresponding research question and hypothesis:

3.1 To examine the direct effect of entrepreneurial intention on technology-based enterprise development among technology-based SMEs in Saudi Arabia (RQ1, H1).

3.2 To assess whether willingness to change mediates the relationship between entrepreneurial intention and technology-based enterprise development in the Saudi context (RQ2, H2).

3.3 To investigate whether digital leadership moderates the relationship between entrepreneurial intention and technology-based enterprise development (RQ3, H3).

3.4 To evaluate whether digital entrepreneurship moderates the relationship between entrepreneurial intention and technology-based enterprise development (RQ4, H4).

4. Research Methodology

4.1 Research Design

The research design used in this study was a quantitative, cross-sectional design to test the associations between entrepreneurial intentions, willingness to change, digital leadership, digital entrepreneurship, and technology-based enterprise development in small and medium-sized enterprises (SMEs) in Saudi Arabia. A survey-based methodology was chosen because it is highly applicable for testing theoretically based models involving latent constructs and complex mediating and moderating associations within entrepreneurship and digital transformation research.

4.2 Population and Sampling

The target population comprised technology-based SMEs engaged in digital products, services, or technology-enabled business models. Data were collected from one hundred and forty-nine managers drawn from a sampling frame of 349 technology-based SMEs in Saudi Arabia. The respondents were founders, co-founders, owners, and top or senior managers who were directly involved in strategic decision-making, innovation efforts, digital transformation efforts, and enterprise development processes. The purposive key-informant sampling method was employed in selecting these respondents because they are well positioned to provide reliable knowledge about entrepreneurial intentions and organizational development outcomes within their firms. In technology-based SMEs, key decision-makers are usually few, decision-making is often centralized, and their perceptions can serve as appropriate proxies for firm-level phenomena.

This study used the firm as the unit of analysis and individual managers as the data collection level. In line with the key-informant research design that is widely applied in SME and entrepreneurship research, individual responses were used to represent organizational-level constructs. This approach is particularly appropriate for SMEs, where firm planning, innovation directions, and digital projects are directly correlated with the thinking, intentions, and leadership practices of owner-managers and top managers. A knowledgeable informant was used to represent each firm, and no aggregation across multiple respondents within the same firm was conducted, hereby reducing potential aggregation bias. Data were collected using a structured questionnaire distributed electronically through email and professional networks. Participation was voluntary, and respondents were assured of anonymity and confidentiality to encourage honest and unbiased responses. Follow-up reminders were sent to improve the response rate. All measurement items were adapted from previously validated scales to ensure reliability and validity.

To mitigate common method bias, a potential concern in single-respondent survey designs, Harman's single-factor test was conducted. The results indicated that no single factor accounted for the majority of total variance, suggesting that common method bias does not critically threaten the validity of the findings.

4.3 Research Instrument

Table 1 Instruments of research

Sr. No	Variables	No of Items	References
1	Entrepreneurial Intention	8 Items	(Yasir et al., 2021)

Sr. No	Variables	No of Items	References
2	Technology-based enterprises development	5 Items	(Dana, Tajpour, Salamzadeh, Hosseini, & Zolfaghari, 2021)
3	Willingness to change	9 Items	(Anwar, Hanif, Abbas, & Gill, 2015; Chen et al., 2024)
4	Digital entrepreneurship	3 Items	(Sobaih & Elshaer, 2022)
5	Digital leadership	6 Items	(Abbu, Mugge, Gudergan, & Kwiatkowski, 2020)

4.3.1 Validity of Research Instrument

This research used Stata-SEM to conduct the structural equation modeling so as to tie the constructs together. Stata-SEM was chosen because it is able to work well on complex models and calculate not only direct effects but also indirect effects between the variables. Generally, the steps in the analysis are composed of model specification, estimation, and examination of fit indices for appropriateness of the model. The measurement model was assessed prior to structural model estimation following the two-step procedure recommended by Anderson and Gerbing (1988). Convergent validity was established through average variance extracted (AVE) exceeding 0.50 and composite reliability (CR) exceeding 0.70 thresholds. This methodological framework will enable a much-needed discussion on the factors influencing technology-based enterprise development in Saudi SMEs and will contribute to better understanding of entrepreneurial dynamics in an increasingly fast-changing economic environment

5. Research Results and Discussion

5.1 Research Results

The results for reliability and convergent validity for all key constructs incorporated in the study are shown in Table 2. Overall, the measurement model results indicate that the constructs achieved the required level of methodological quality, providing a solid basis for interpreting the structural relationships in this study. The internal consistency and convergent validity of all constructs are satisfactory, ensuring that the identified variables reflect the theoretical concepts sufficiently well. More specifically, the observed level of measurement quality across constructs supports confidence in the substantive findings of the study. The validity of the entrepreneurial intention measurement suggests that the effect of this factor on technology-based enterprise development reflects a motivational influence rather than measurement error. In the same vein, the theorized role of willingness to change is supported by the adequate measurement of this construct, particularly in terms of translating entrepreneurial intention into adaptive behavior in technology-based SMEs. The satisfactory validity of digital leadership and digital entrepreneurship is especially important for the theoretical contribution of the study. The findings demonstrate that both constructs are empirically differentiated and strong enough to be used as boundary conditions within the proposed framework. This complements the validity of moderation results, as leadership skills and digital entrepreneurial behaviors showed significant impacts on how entrepreneurial intention affects enterprise development in digitally intensive settings.

Table 2 Variables reliability and validity

Variable	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Entrepreneurial Intention	0.854	0.886	0.530
Technology-based enterprises development	0.884	0.825	0.555
Willingness to change	0.816	0.887	0.537
Digital entrepreneurship	0.845	0.875	0.581
Digital leadership	0.786	0.836	0.571

This also shows that Technology-Based Enterprise Development demonstrates strong reliability, with Cronbach's Alpha of 0.884 and Composite Reliability of 0.825, both of which indicate high internal consistency. An AVE value of 0.555 suggests that this construct also exhibits good convergent validity, as the items applied in the scale reliably measure the underlying technology-based enterprise development concept. High reliability values mean that the scale consistently measures the construct and is therefore important for distinguishing its effect in the research setting. In the case of Willingness to Change, Cronbach's Alpha of 0.816 and Composite Reliability of 0.887 indicate that the construct is stable and internally consistent. Good convergent validity is also demonstrated with an AVE of 0.537, indicating that this scale measures the conceptual nature of the construct in an appropriate manner. Likewise, Digital Entrepreneurship shows Cronbach's Alpha of 0.845 and Composite Reliability of 0.875, indicating high internal consistency and reliability. The AVE of 0.581 confirms that this construct captures a meaningful proportion of variance in its related items, further supporting its validity. Lastly, Digital Leadership records Cronbach's Alpha of 0.786 and Composite Reliability of 0.836, both of which meet the accepted threshold for reliability. Its AVE value of 0.571 also indicates satisfactory convergent validity, although the comparatively lower reliability coefficient may suggest scope for future refinement of the measure.

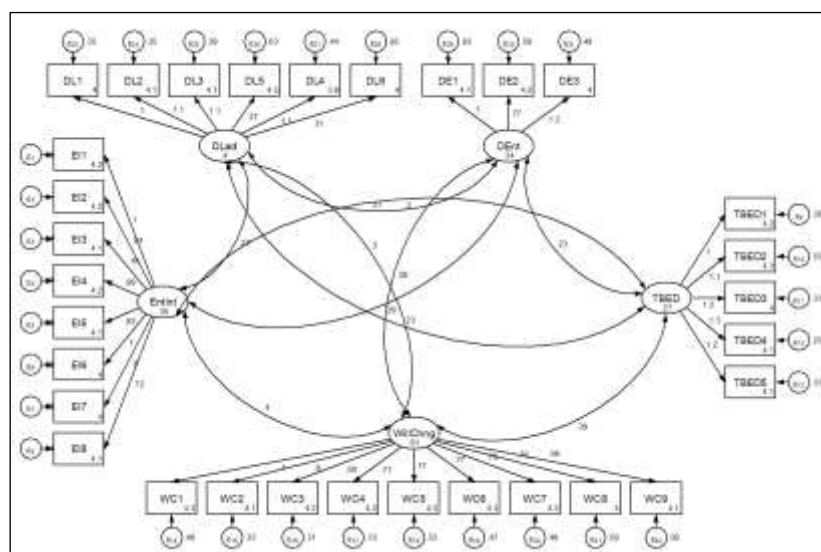

Figure 2 Estimated Model

Table 3 Confirmatory Factor Analysis

Measurement	OIM Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
EI1	1.000	(constrained)				
EI2	0.521	0.040	10.074	0.000	0.505	0.683
EI3	0.546	0.043	9.765	0.000	0.525	0.718
EI4	0.828	0.078	8.212	0.000	0.769	0.237
EI5	3.224	0.036	68.927	0.000	0.719	0.233
EI6	3.272	0.036	70.278	0.000	0.127	0.287
EI7	0.760	0.075	7.834	0.000	0.699	0.153
EI8	0.792	0.075	8.174	0.000	0.735	0.190
TBED1	1.000	(constrained)				
TBED2	0.897	0.081	8.591	0.000	0.842	0.322
TBED3	0.751	0.075	7.764	0.000	0.688	0.142
TBED4	3.181	0.038	64.276	0.000	0.182	0.189
TBED5	0.761	0.076	7.764	0.000	0.698	0.156
WC1	1.000	(constrained)				
WC2	3.277	0.035	72.836	0.000	0.135	0.290
WC3	0.789	0.087	7.030	0.000	0.706	0.213
WC4	3.172	0.034	72.001	0.000	0.017	0.169
WC5	0.752	0.068	8.598	0.000	0.706	0.128
WC6	3.112	0.036	66.748	0.000	0.032	0.105
WC7	3.109	0.033	71.769	0.000	0.035	0.097
WC8	3.188	0.035	70.757	0.000	0.034	0.189
WC9	3.339	0.040	64.623	0.000	0.194	0.373
DL1	1.000	(constrained)				
DL2	3.296	0.045	56.813	0.000	0.134	0.334
DL3	0.974	0.075	9.974	0.000	0.613	0.398

DL4	0.652	0.056	9.031	0.000	0.618	0.664
DL5	3.205	0.031	79.665	0.000	0.061	0.200
DL6	0.687	0.058	9.155	0.000	0.653	0.763
DE1	1.000	(constrained)				
DE2	3.107	0.038	63.619	0.000	0.081	0.103
DE3	3.210	0.034	72.542	0.000	0.060	0.213

The coefficients show strong relationships between indicators, indicating a robust and statistically significant structure for the constructs assessed in this study as shown in Table 3. EI2 to EI8 have high coefficients, especially EI5 (3.224) and EI6 (3.272), indicating that they are strong predictors of Entrepreneurial Intention (EI). Technology-Based Enterprise Development (TBED) items, especially TBED4 (3.181), have strong relationships, confirming their relevance in the measurement model. The Willingness to Change (WC) construct has substantial coefficients, including WC2 (3.277) and WC4 (3.172), demonstrating their importance in capturing this dimension. Similarly, Digital Leadership (DL) and Digital Entrepreneurship (DE) have strong indicators, with DL2 (3.296) and DE2 (3.107) contributing significantly. All indicators have p-values of 0.000, confirming their statistical significance and supporting the reproducibility of construct measurement in the research. These results validate the measurement model and show construct interrelationships, laying the groundwork for subsequent structural analysis. Note: These are unstandardized OIM coefficients; the large values (e.g., EI5 = 3.224, WC2 = 3.277) reflect the latent variable scale set by the reference indicator fixed to 1.000, and should not be interpreted as standardized loadings. Standardized loadings are shown in Table 4.

The original sample coefficients across the key variables reveal the strength of the indicator–construct relationships as shown in Table 4. EI5 (0.849) and EI4 (0.805) have the highest coefficients for Entrepreneurial Intention, suggesting that they are the most important indicators. EI7 (0.535) and EI8 (0.653) have weaker associations. For Technology-Based Enterprise Development, TBED3 (0.785) and TBED5 (0.737) are key indicators. The most influential indicators for Willingness to Change are WC5 (0.885) and WC4 (0.844), emphasizing the importance of adaptability in entrepreneurship. The standardized loadings for Digital Leadership are highest for DL2 (0.807), and for Digital Entrepreneurship highest for DE2 (0.728). These coefficients show that different indicators contribute significantly to their respective constructs, thereby supporting the measurement model used in this research.

Table 4 Measurement Items Fitness Statistics

Variable	Indicator	Original Sample
Entrepreneurial Intention	EI1	0.705
	EI2	0.759

	EI3	0.782
	EI4	0.805
	EI5	0.849
	EI6	0.796
	EI7	0.535
	EI8	0.653
Technology-based enterprises development	TBED1	0.546
	TBED2	0.692
	TBED3	0.785
	TBED4	0.709
	TBED5	0.737
Willingness to change	WC1	0.645
	WC2	0.671
	WC3	0.686
	WC4	0.844
	WC5	0.885
	WC6	0.710
	WC7	0.859
	WC8	0.531
	WC9	0.520
Digital Leadership	DL1	0.550
	DL2	0.807
	DL3	0.706
	DL4	0.735
	DL5	0.751

	DL6	0.594
Digital Entrepreneurship	DE1	0.587
	DE2	0.728
	DE3	0.717

Table 5 shows Chi-square fit statistics, which are essential for comparing model fit to the saturated model. The proposed model fits the data better than a null model, as indicated by a Likelihood Ratio of 2046.3329 and a p-value of 0.000. With a p-value of 0.000, the baseline versus saturated Chi-square statistic ($\chi^2_{bs}(2728) = 913.81122$) supports this finding and further indicates the model's robustness. These statistics show that the hypothesized model is statistically significant and captures the relationships among the constructs, validating its ability to represent the data's complexity.

Table 5 Chi-square Fit statistics

Fit statistic	Value	Description
Likelihood ratio	2046.3329	model vs. saturated
$p > \chi^2$	0.000	
$\chi^2_{bs}(2728)$	913.81122	baseline vs. saturated
$p > \chi^2$	0.000	

Analysis of the saturated and estimated models indicates acceptable model fit and explanatory power for the focal constructs shown in Table 6. The Saturated Model SRMR (Standardized Root Mean Square Residual) is 0.052, which suggests a good fit, whereas the SRMR for the Estimated Model is 0.064, which remains within an acceptable range, suggesting that the model fits the observed relationships among the variables well. The R-squared values for Technology-Based Enterprise Development (0.342) and Willingness to Change (0.428) reveal the amount of variance explained by the model. The R-squared value of 0.428 for Willingness to Change indicates that the model explains a considerable proportion of its variability. Together, these measures support the adequacy of the model and provide evidence for the theoretical relationships hypothesized in the research framework.

Table 6 R-square statistics Model Goodness of Fit Statistics

	Saturated Model	Estimated Model	R Square
SRMR	0.052	0.064	
Technology-based enterprises development			0.342
Willingness to change			0.428

Table 7 shows the path analysis results, revealing the relationships between the constructs studied. The coefficient of 0.333, z-value of 2.265, and p-value of 0.024 show that

Entrepreneurial Intention significantly affects technology-based enterprise development. Willingness to Change also mediates the relationship between entrepreneurial intention and technology-based enterprise development, as shown by a coefficient of 0.454 and a z-value of 4.039, highlighting its importance in this relationship.

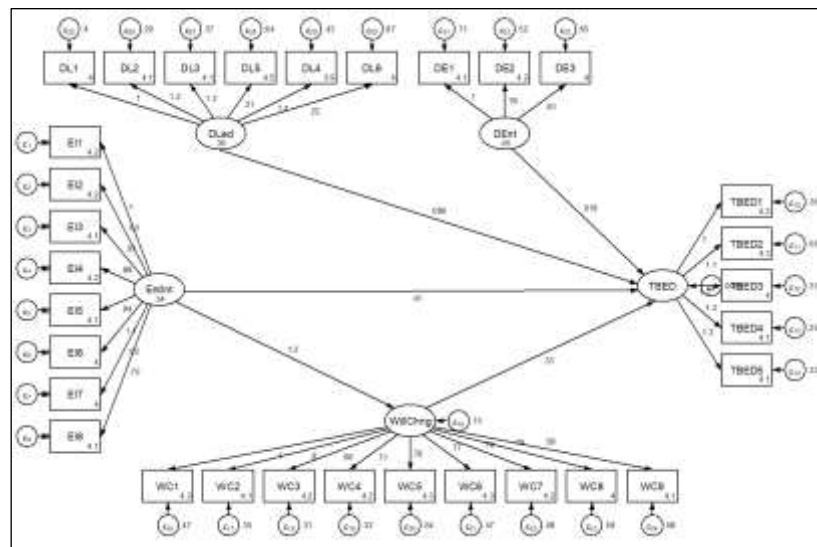


Figure 3 Structural Model for Path Analysis

Digital Leadership also moderates the relationship between entrepreneurial intention and technology-based enterprise development, with a coefficient of 0.437 and a z-value of 4.461, highlighting its importance in strengthening entrepreneurial efforts. Finally, with a coefficient of 0.286 and z-value of 1.958, $p = 0.050$, Digital Entrepreneurship also demonstrates a moderating effect. These findings demonstrate the interconnectedness of these constructs and support the research framework's hypothesized relationships.

Table 7 Path Analysis

	OIM Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
Entrepreneurial intention significantly influences the technology-based enterprises development.	0.333	0.118	2.265	0.024	0.197	0.264
Willingness to change significantly mediates the relationship of entrepreneurial intention and technology-based enterprises development.	0.454	0.050	4.039	0.000	0.133	0.390
Digital leadership significantly moderates the relationship of entrepreneurial intention and technology-based enterprises development.	0.437	0.044	4.461	0.000	0.268	0.361
Digital entrepreneurship significantly moderates the relationship of entrepreneurial intention and technology-based enterprises development.	0.286	0.070	1.958	0.050	0.148	0.424

Table 8 presents the decomposed direct, indirect, and total effects for the mediation of willingness to change (H2), as required for comprehensive mediation reporting.

Table 8 Direct, Indirect, and Total Effects (Mediation via Willingness to Change)

Effect	Coefficient	Std. Err.	z	p-value
Direct: EI to TBED (controlling WC)	0.333	0.118	2.265	0.024
Indirect: EI to WC to TBED	0.454	0.050	4.039	< 0.001
Total effect (direct + indirect)	0.787			

6. Discussion

The convergence of entrepreneurial intention and the digital economy has become central to understanding technology-based enterprise creation. In an unstable economy that demands continuous innovation and transformation, entrepreneurs act not only from aspiration but also from strategic necessity. The interaction among entrepreneurial intention, willingness to change, digital leadership, and digital entrepreneurship clarifies how these factors shape the development of technology-driven businesses. This study examines these relationships, demonstrating how internal motivation interacts with external capabilities and leadership to transform ideas into viable enterprises.

The findings confirm that entrepreneurial intention is a key driver of technology-based enterprise development in Saudi SMEs. This supports the Theory of Planned Behavior (Ajzen, 1991), which positions intention as the immediate predictor of behavior, and aligns with studies linking strong entrepreneurial intentions to opportunity recognition and technological innovation (Troise et al., 2022; Zhai et al., 2023). Positioned within Saudi Vision 2030, where digitalization and innovation policies are central, the results reflect high entrepreneurial motivation similar to other emerging economies (Nguyen & Nguyen, 2024), although institutional constraints may limit implementation. The moderate effect size ($b = 0.333$) suggests that intention alone is insufficient and requires complementary roles from willingness to change, digital leadership, and digital entrepreneurship. This aligns with the intention–performance gap identified in prior research.

Willingness to change plays a critical mediating role in translating intention into performance. Consistent with Sandhi et al. (2024) and Zulfitri and Sari (2024), adaptability and openness to change enhance entrepreneurial success in technology-based industries. Entrepreneurs who adjust strategies, adopt new technologies, and revise business models are better able to convert intentions into innovation. This study emphasizes individual adaptability alongside leadership-driven transformation (Bilgiseven, 2024). The stronger indirect effect ($b = 0.454$) compared to the direct effect indicates that willingness to change is the primary pathway through which entrepreneurial intention influences enterprise development. This extends prior research by demonstrating its dominance over the direct intention–performance relationship.

Digital leadership also emerges as a strong moderator, strengthening the relationship between entrepreneurial intention and enterprise development. This supports findings by Destrian and Sudarma (2024) and Chen et al. (2024), which show that digitally competent leaders enhance agility and innovation. Digital leadership enables entrepreneurs to translate intentions into strategic actions through data-driven decisions, technology adoption, and innovation-oriented cultures. This is particularly relevant in Saudi SMEs, where leadership is often centralized. Developing digital leadership competencies can reduce rigidity and promote experimentation, which is essential for adapting to rapid technological change under Vision

2030. In this context, digital leadership functions as a capability that transforms entrepreneurial motivation into organizational performance.

Similarly, digital entrepreneurship acts as a moderating factor by providing structural and operational support within the digital economy. Consistent with Yanez-Valdes and Guerrero (2024), digital entrepreneurship enhances scalability, speed, and global market access. It strengthens the intention–enterprise development relationship by offering digital ecosystems and technological resources that enable innovation. In Saudi Arabia, strong government support for digital infrastructure creates opportunities for SMEs to rapidly operationalize entrepreneurial ideas. Compared to market-driven contexts, institutional support accelerates digital venture development. However, digital leadership ($b = 0.437$) exerts a stronger moderating effect than digital entrepreneurship ($b = 0.286$), suggesting that internal capabilities are more critical than external digital access in this context.

Overall, the results indicate that entrepreneurial intention provides the motivational foundation for enterprise creation, but its effectiveness depends on adaptability, leadership, and digital capabilities. These findings align with digital entrepreneurship theories (Malodia et al., 2023) while highlighting context-specific dynamics within Saudi Arabia's policy-driven economic model. The study emphasizes the need to integrate psychological, organizational, and institutional factors in understanding entrepreneurship.

Although all hypotheses are supported, the findings reveal that entrepreneurial intention alone is insufficient for success. Its impact depends on willingness to change and is strengthened by digital leadership and digital entrepreneurship. This framework highlights the importance of flexibility, strategic leadership, and effective use of digital tools in entrepreneurship. As the digital economy evolves, these insights contribute to both theory and practice by identifying key factors that support innovation and growth in technology-driven industries.

7. Implications of the Study

This study contributes to theory by integrating entrepreneurship, digital leadership, and organizational change into a unified framework for understanding technology-based enterprise development. It confirms the direct role of entrepreneurial intention while extending the Theory of Planned Behavior by demonstrating that intention also drives enterprise outcomes. The identification of willingness to change as a mediator highlights the importance of adaptability in converting intention into success, supporting the dynamic capabilities perspective.

Furthermore, the moderating roles of digital leadership and digital entrepreneurship extend leadership and entrepreneurship theories by emphasizing the importance of digital competencies. In the digital economy, leaders must not only manage organizations but also leverage digital tools to drive innovation. This study therefore supports a more integrated theoretical model that connects intention, adaptability, leadership, and digital capabilities. It also provides a foundation for future research across different industries and cultural contexts. From a practical perspective, the findings are highly relevant for Saudi SMEs operating under Vision 2030. First, the importance of entrepreneurial intention suggests that development programs should focus on building entrepreneurial mindsets through education and training. Universities and incubators can promote opportunity recognition, self-efficacy, and innovation. Second, the role of willingness to change highlights the need for flexible organizational cultures. Agile management, continuous learning, and digital readiness initiatives can enhance adaptability among employees and leaders.

Third, the strong moderating effect of digital leadership underscores the need for leadership development programs focused on digital skills, data analytics, and innovation management. These programs can be implemented through national institutions such as MCIT and Monshaat, aligning with Vision 2030 priorities. Finally, the role of digital entrepreneurship

suggests that SMEs should actively adopt digital tools such as e-commerce, cloud computing, and AI to improve competitiveness and market reach.

Policymakers should support SMEs through digital adoption incentives and capacity-building programs to overcome barriers and ensure sustained digital transformation. Collectively, these efforts can position Saudi SMEs as key contributors to a diversified, knowledge-based economy.

8. Conclusions

This study significantly contributes to the body of knowledge on the complex relationships among entrepreneurial intention, willingness to change, digital leadership, and digital entrepreneurship in the development of technology-based enterprises. The results show that entrepreneurial intention serves as the foundational motivational driver of technology-based enterprise development and is essential for achieving critical business outcomes. Against this background, the study identifies willingness to change as a critical mediating variable and emphasizes the need to cultivate an adaptive mindset that enables entrepreneurs and organizations to respond effectively to the requirements of the digital environment. The supplementary moderator roles of digital entrepreneurship and digital leadership demonstrate their capacity to strengthen the entrepreneurial process by aligning leadership strategies and digital capabilities with technological innovation. Taken together, these findings not only support existing theory but also provide practical suggestions for practitioners who seek to navigate modern entrepreneurship dynamics. Entrepreneurship is a dynamic field due to changing technologies and markets, and therefore this study is highly timely in its analysis of the factors that have a substantial influence on the successful establishment of technology-based firms. The results are relevant not only to academic discourse but also to entrepreneurs, organizational managers, and policymakers. By clarifying the interdependence of intention, flexibility, leadership, and digital skills, this study helps stakeholders identify effective strategies that can be adopted to promote innovation and growth. The present study opens up promising opportunities for future research to expand the contexts of such relationships and continue examining the key components of successful entrepreneurship in an ever-digitizing world. The exploration and application of these observations can help the entrepreneurial community adapt to changing economic paradigms.

9. Recommendations

According to the results of this research, the following recommendations can be made

Short term (0–2 years): Saudi SME development programs are recommended to focus on developing entrepreneurial mindsets through educational and training programs in universities and business incubators, with emphasis on opportunity recognition, self-efficacy, and proactive innovation. Continuous learning models, agile management frameworks, and digital readiness tests should foster organizational cultures that promote flexibility and experimentation.

Long term (3–5 years): Saudi Arabia should develop systematic digital leadership programs focused on digital literacy, data analytics, and innovation management. These courses, provided by MCIT-affiliated institutions, should include data-driven decision-making, AI tools, digital strategy, and cross-sector leadership issues aligned with Vision 2030 priority areas. SMEs in Saudi Arabia should also take the initiative to implement e-commerce ecosystems, cloud computing, and AI-based solutions to gain market share and minimize transaction costs. Policymakers are encouraged to introduce phased digital platform adoption subsidies and mitigation measures, such as technology partnerships and capacity-building grants, to ensure that adoption is sustained beyond initial uptake.

10. Limitation and Future Research

Despite its contributions, this study has several limitations that should be considered when interpreting the findings. First, the empirical context is Saudi Arabia, which has distinctive cultural, institutional, and economic characteristics. Organizations in this setting often exhibit centralized decision-making structures, higher power-distance norms, and strong government involvement in economic and digital transformation under Vision 2030. These conditions may amplify the effects of entrepreneurial intention, willingness to change, and digital leadership on enterprise development, potentially producing stronger relationships than those observed in more decentralized or market-driven economies.

Second, the roles of digital leadership and digital entrepreneurship may be uniquely shaped by the country's state-led digital transformation. Government support, regulatory facilitation, and national digital infrastructure initiatives can ease the translation of entrepreneurial intention into actual enterprise creation. While this strengthens internal validity, it may limit the generalizability of the findings to contexts where digitalization is primarily market-driven and institutional support is less pronounced. Therefore, caution is required when applying these results to other emerging or developed economies with different policy environments and entrepreneurial ecosystems.

Third, cultural values related to risk-taking, uncertainty avoidance, and social norms may influence both entrepreneurial intention and willingness to change in ways specific to the Saudi context. These cultural dimensions shape attitudes toward innovation and organizational adaptation, suggesting that the observed relationships may differ in societies with alternative cultural profiles. Future research should replicate this framework across diverse institutional and cultural settings, including cross-country comparative studies, to better establish its robustness and boundary conditions.

Additionally, this study adopts a firm-level perspective based on key informants. Future research could employ multi-level or longitudinal designs to capture the dynamic evolution of entrepreneurial behavior and enterprise development over time.

Finally, the moderation tests for H3 and H4 were modeled as additive effects in Stata-SEM rather than true interaction terms. To more rigorously test moderation, future studies should incorporate interaction effects (e.g., $EI \times DL$ and $EI \times DE$) or apply multi-group analysis.

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