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RESEARCH ARTICLE

Enhancing Digital Innovation Performance: The Role of Strategic Foresight, Entrepreneurial Bricolage, and Strategic Ambidexterity Among Female Entrepreneurs in Saudi Arabia

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ABSTRACT

The digital innovation performance (DIP) of family-owned small businesses (F-OSB) has become a critical area of research for competing in the rapidly evolving digital landscape and advancing Saudi Vision 2030. This study investigates the relationship between strategic foresight and DIP through the mediating mechanism of innovation bricolage and the moderating mechanism of strategic ambidexterity. This study used a cross-sectional survey design to collect primary data from 261 female entrepreneurs managing their F-OSBs in four Saudi Arabian cities. Partial least squares structural equation modeling was employed for data analysis. The findings show that strategic foresight directly relates to DIP. Moreover, innovation bricolage mediates the relationship between strategic foresight and DIP. Additionally, strategic ambidexterity does not moderate the relationship between strategic foresight and innovation bricolage but strengthens the relationship between innovation bricolage and DIP. This study enriches the dynamic capability view theory (DCVT) by illustrating how female entrepreneurs in F-OSBs leverage strategic foresight to improve DIP despite resource constraints. It highlights the mediating role of entrepreneurial bricolage in transforming foresight to attain DIP. It reveals how female entrepreneurs can balance exploration and exploitation effectively and optimize DIP in a challenging socio-cultural country like Saudi Arabia using their strategic ambidexterity. Dynamic capability view theory provides novel empirical evidence by investigating the mechanisms and boundary conditions between strategic foresight and DIP.

INTRODUCTION

The digital revolution has provided new opportunities and challenges for family-owned small businesses (F-OSB) to innovate and transform their operations [1]. F-OSBs faced unique disruptions and challenges during COVID-19, which ignited the need to swap traditional operating patterns for digitalization to secure survival in the dynamic digital era. The National Centre for Family Business in Saudi Arabia revealed that a large number of entrepreneurs had to close their businesses during the pandemic due to a lack of digital preparedness and online presence [2]. Ughetto, Rossi [3] revealed that female entrepreneurs are less likely to engage in digital innovation activities than their male counterparts. However, female entrepreneur's engagement in digital activities is alarmingly low due to socio-cultural constraints in Saudi Arabia [4].

Digital innovation activities enable F-OSBs to automate their transaction processes and enhance operational efficiency, resulting in cost reduction, improved customer satisfaction, and long-term sustainable growth [5]. Al Rawaf and Alfalih [6] revealed that fewer than 10% of family businesses have effectively innovated and implemented digital solutions to achieve strategic objectives like profitability and long-term sustainable goals. In addition, F-OSBs face high failure rates due to a lack of digital readiness and resources, stringent values, and poor digital skills among successors and family members, which steer toward reluctance to adopt digital innovation [7]. Limited access to digital data analytics, poor cybersecurity provisions, and inadequate digital infrastructure also hinder digital innovation activities in F-OSBs. So, a need arises to investigate digital innovation performance (DIP) in F-OSBs.

Previous studies have examined the individual and organizational-level capabilities in the digital innovation process [8]. Organizational-level capabilities like a firm's dynamic capabilities, digital orientation, and ambidexterity facilitate digital innovation activities [9]. Additionally, individual-level capabilities such as absorptive capacity and digital leadership influence digital innovation [10]. In addition, Homburg and Wielgos [11] revealed that a firm's strategic commitment and usage of digital technologies create new value propositions and digital capabilities, increasing its ability to manage and use digital technologies effectively. Other scholars Hermann, Gollhardt [12] have identified that external stakeholders, such as university and government partnerships, support SMEs in taking digital innovation initiatives. However, Ko and Yang [13] it endorsed that, without a future-oriented perspective (i.e., strategic foresight), these factors might lead to short-term gains rather than long-term sustainable growth. Cochran and Kuratko [14] argued that an entrepreneur's vision enables organizations to anticipate future trends and disruptions, preparing them for long-term success rather than simply reacting to immediate challenges. However, the female entrepreneur's strategic foresight and how it shapes the DIP of their F-OSBs has been a significantly under-researched area. So, this leads to the first research question: R.Q.1: Does a female entrepreneur's strategic foresight have a relationship with DIP?

Entrepreneurial bricolage refers to an entrepreneur's ability to creatively utilize limited resources to solve problems or explore new possibilities. Xu, He [15] have used entrepreneurial bricolage as a predictor and mediator in resource-constrained environments. Sahi, Modi [16] investigated how entrepreneurs utilize available resources creatively to develop innovative products. [17] revealed how the entrepreneur's bricolage capabilities instigate them to perform innovative activities despite limited means. Entrepreneur's concerns about the firm's future urge them to engage in bricolage activities to transform their limited resources and achieve creative solutions. Zheng [18] revealed that an individual's foresight motivates them to solve problems proactively through resourceful recombination of existing resources, which can bridge the digital divide and attain high innovation performance. Thus, entrepreneurial bricolage is crucial in a firm's innovative activities. However, Alva, Vivas [19] revealed that entrepreneurial bricolage activities are less likely to prevail in F-OSBs due to their limited access to capital and the change-resistant nature of family members. In addition, a limited number of family business researchers have investigated the role of entrepreneurial bricolage in businesses with deep-rooted ancestral knowledge and established values. Nor does it address how it supports the strategic vision of female entrepreneurs in achieving DIP. So, this gap in literature leads to the second research question: R.Q.2 Does entrepreneurial bricolage bridge between strategic foresight and DIP?

Strategic ambidexterity refers to a firm's ability to explore new opportunities and exploit existing capabilities simultaneously. Previous studies have used strategic ambidexterity as an antecedent to predict entrepreneurial activities. For instance, Alaskar, Alsadi [20] examined how firms with ambidextrous capabilities can outperform in an innovation-oriented environment. Similarly, Hossain, Teh [21] find that a visionary leader can cultivate ambidextrous behavior among employees, yielding innovative and cost-effective products. In addition, Restuputri, Masudin [22] find that ambidextrous capabilities enhance a firm's ability to capitalize on new business opportunities and manage operational activities simultaneously, which leads to improved organizational performance.

Strategic ambidexterity supports family firms in preserving their legacy while adopting new digital technologies for long-term survival [23]. However, how female entrepreneurs' foresight capabilities strategically use available resources to perform innovation activities through ambidextrous behavior remains unexplored. So this leads to the third research question: R.Q.3 Does strategic ambidexterity strengthen or weaken the relationship between female entrepreneurial strategic foresight and entrepreneurial bricolage?

Firms balancing exploitation and exploration achieve sustained competitive advantage in innovation-centric firms. This balance allows firms to survive in highly competitive and turbulent environments. Rafik [24] highlight that ambidextrous organizations are better positioned to navigate the tensions between stability and flexibility, making them more successful in achieving sustained innovation. Bricolage can sometimes lead to incremental innovations due to its reliance on existing resources, which might limit the potential for breakthrough digital innovations. This is where strategic ambidexterity becomes essential, as it ensures that the improvisational aspect of bricolage is balanced with a broader vision for both incremental and radical innovations. Waseel, Zhang [25] found that ambidexterity in organizations led to enhanced innovation performance by facilitating a dual focus on efficiency and experimentation. Tehseen, Kayani [26] revealed that strategic ambidexterity can help firms take advantage of bricolage activities while ensuring that improvisation aligns with immediate operational needs and long-term strategic goals to attain innovation performance. However, family business literature has not addressed the impact of strategic ambidexterity on entrepreneurial bricolage in F-OSBs to drive DIP. This leads to the fourth research question: R.Q.4 Does strategic ambidexterity strengthen the relationship between entrepreneurial bricolage and DIP?

The study explores how strategic foresight, entrepreneurial bricolage, and strategic ambidexterity drive DIP in F-OSBs led by female entrepreneurs. It expanded the dynamic view capability theory (DVCT) and provided insight into how female entrepreneurs owning F-OSBs can use their dynamic capabilities to overcome resource constraints and traditional values, ultimately fostering DIP. The objectives of this study support Saudi Vision 2030, providing a roadmap for female entrepreneurs to anticipate future trends, implement digital innovations, and balance short-term profitability with long-term growth in an emerging and dynamic digital era.

LITERATURE REVIEW

This section explains the findings from the reviewed literature, which establishes a direct link between strategic foresight and digital innovation performance, along with how entrepreneurial bricolage mediates this relationship. Moreover, this study revealed that strategic ambidexterity moderates the relationship between strategic foresight, entrepreneurial bricolage, and digital innovation performance.

DIP refers to successfully generating and implementing digitally-enabled innovations that support firms in achieving superior performance outcomes [27]. Foltean and van Bruggen [28] revealed that emerging technological capabilities, such as artificial intelligence, blockchain, and the Internet of Things, enable firms to improve their DIP by enhancing operational efficiency, reducing costs, and improving customer experience. Ardito, Raby [29] have examined DIP in different aspects, such as organizational and industrial levels. For instance, Cheng and Wang [30] revealed that the availability of digital infrastructure and platforms shapes firms' innovation capabilities across industries. Khin and Ho [31] investigated how technology-oriented firms can attain their sustainable competitiveness by using digital technologies. Wolfert, Verdouw [32] point out that digital innovation ecosystems have the potential to reshape industries. Most studies have examined how digital technologies can improve innovation activities, efficiency, and response to changing market demands. However, research on DIP remains limited in SMEs, especially in the context of F-OSBs owned by females.

Strategic foresight refers to identifying and interpreting environmental signals and transforming them into a vision to guide long-term innovation efforts. Entrepreneur's strategic foresight helps firms to sense and analyze the market and shape their strategies to attain long-term goals. Greenblott, O'Farrell [33] revealed that scenario planning, trend analysis, and environmental scanning with strategic foresight can enable public sector firms to proactively respond to emerging market trends, anticipate potential disruptions, and achieve sustainable competitive advantage. In addition, Fergnani [34] examined how foresight capabilities can handle disruptive changes and reconfigure the large firm's resources to adapt to the changing business landscape. Calof, Meissner [35] emphasized that strategic foresight capabilities support identifying new digital technologies and extend their current innovation efforts to develop and implement digital innovations in corporate firms. However, the role of female entrepreneur's strategic foresight in F-OSBs has largely been neglected.

Strategic foresight contributes to shaping long-term strategies and supports how firms can attain resilience in the dynamic digital era. Sharma, Luthra [36] revealed that firms who are prepared to deal with unpredictable disruptions and proactively make strategies to align with upcoming tech advancements can attain sustainable performance. Entrepreneurs with strong foresight capabilities take the initiative to incorporate digital technologies into their operations [37]. Moreover, firms continuously scan technological trends and integrate them into business models to improve operational efficiency, enhance customer experience, and introduce sustainable products and services [38].

Similarly, Leceta and Könnölä [39] highlight that firms capable of leveraging foresight for innovation activities can better navigate the digital ecosystem's uncertainties and develop effective performance. The lens of DCVT suggests that strategic foresight enables F-OSB to sense market shifts, seize opportunities, and transform its resource base to achieve superior DIP. F-OSBS has a well-knitted family structure, established traditions, scarce resources, and limited digital maturity [40]. However, how the female entrepreneur's strategic foresight can drive DIP in such a business needs thorough investigation. So, based on theory and literature review, the proposed hypothesis is:

(H1): Strategic foresight has a relationship with DIP.

Entrepreneurial bricolage refers to the process of using limited resources (such as time, knowledge, and skills) to create innovations and value. Lévi-Strauss initially proposed this concept and later applied it to the entrepreneurship domain. Entrepreneurial bricolage has been studied in firms with resource constraints and unpredictable environments. For instance, Jewer, Pourasgari [41] explored the role of bricolage in social entrepreneurship, where entrepreneurs in developing economies leverage scarce local resources to address pressing social challenges. Similarly, Baier-Fuentes, Andrade-Valbuena [42] examined entrepreneurial bricolage in SMEs by using available resources innovatively to overcome resource limitations and achieve growth. Wang, Yu [43] also endorsed that entrepreneurial bricolage is relevant when investigating small or nascent ventures where firms have scarce resources. Wu, Luo [44] have examined the role of bricolage in corporate entrepreneurial activities and commercial innovation in large firms. However, how entrepreneurial bricolage contributes to F-OSBS, which has constrained resources and traditional mindsets and resists the induction of external knowledge, has not yet been explored.

Entrepreneurs with strong strategic foresight can anticipate upcoming technical and innovative activities from various perspectives. Therefore, the link between strategic foresight and innovation outcomes is complex and requires a mediating mechanism for deeper understanding. Strategic foresight enables entrepreneurs to anticipate future trends, threats, and opportunities, which may inspire them to engage in entrepreneurial bricolage to leverage limited resources and create novel solutions [45]. Bricolage, as a strategic approach, assists enterprises in achieving innovation and enhancing their competitive positioning [46]. Abid, Dowling [47] revealed that bricolage allows firms to use the recombination of existing resources to achieve innovative performance by using their intellectual capital. Similarly, Chang, Webster [48] also supported that bricolage helps firms utilize

limited resources to generate novel solutions, improving their overall performance. The lens of DCVT argues that strategic foresight enables F-OSBs to sense market shifts, seize opportunities, and transform their available resource to achieve superior DIP. Thus, existing literature and theory establish a connection between strategic foresight, entrepreneurial bricolage, and DIP. So, the proposed hypothesis is:

(H4): Entrepreneurial bricolage mediates between strategic foresight and DIP.

Strategic ambidexterity refers to a firm's ability to simultaneously exploit its existing capabilities and explore new opportunities for innovation and growth. Strategic ambidexterity has been conceptualized as a dynamic capability that allows firms to reconfigure their resources and capabilities to address environmental changes [49]. Esfandyarpour, Arasti [50] investigated high-tech manufacturers and found that firms must implement organizational processes that enable radical and incremental innovation to achieve strategic ambidexterity. Similarly, firms need to balance exploration and exploitation in their business processes to achieve digital transformation [51]. Organizational capabilities and processes that allow ambidextrous innovation are critical for firms facing disruptive change [52].

Hossain, Kumar [53] investigated how strategic ambidexterity enables firms to adopt cutting-edge digital technologies and optimize existing operations to maintain competitiveness. Despite the importance of strategic ambidexterity, research has found that firms need help to pursue exploratory and exploitative innovation simultaneously. Höft and Olivan [54] calls for more research on strategic ambidexterity in F-OSBs because upholding norms, family members' differing visions, and dealing with pressure to optimize existing operations and radically innovate is very complex [55].

Wu, Liu [56] suggested that strategic ambidexterity and entrepreneurial bricolage may be a powerful combination that enables firms to navigate changing business environments. Firms that combine strategic ambidexterity with a bricolage mindset can leverage existing resources in novel ways to explore new opportunities while optimizing existing operations. Bricolage capabilities can enable ambidextrous organizations to recombine existing resources in novel ways to drive innovation [57]. Tajeddini, Gamage [58] revealed that developing cost-saving innovative products may facilitate strategic ambidexterity by allowing firms to rapidly adapt their resource base to pursue new opportunities while improving operational efficiency. However, how strategic ambidexterity influences the entrepreneurial bricolage in F-OSBs needs further investigation. DCVT pointed out that firms continuously reconfiguring their resources can collaborate with environmental changes. However, the family business literature has yet to examine how strategic ambidexterity and entrepreneurial bricolage can be combined as a dynamic capability to enable F-OSBs to navigate dynamic competitive landscapes. So, the proposed hypothesis is:

(H2): Strategic ambidexterity has a relationship with entrepreneurial bricolage.

Strategic foresight allows firms to anticipate future trends and challenges, but with the ability to balance exploration and exploitation, these insights may translate into meaningful, resourceful actions. Abid, Doblinger [59] revealed that firms that manage exploration (future-oriented innovations) and exploitation (current operations) are better equipped to leverage foresight to attain practical, innovative solutions like bricolage. Firms often face resource and capabilities constraints; strategic ambidexterity can enhance their ability to foresee future needs and take action through bricolage [60]. These firms can remain agile and innovative despite limited resources by combining long-term foresight with flexible resourcefulness. However, how strategic ambidexterity influences strategic foresight and entrepreneurial bricolage in F-OSBs requires further exploration.

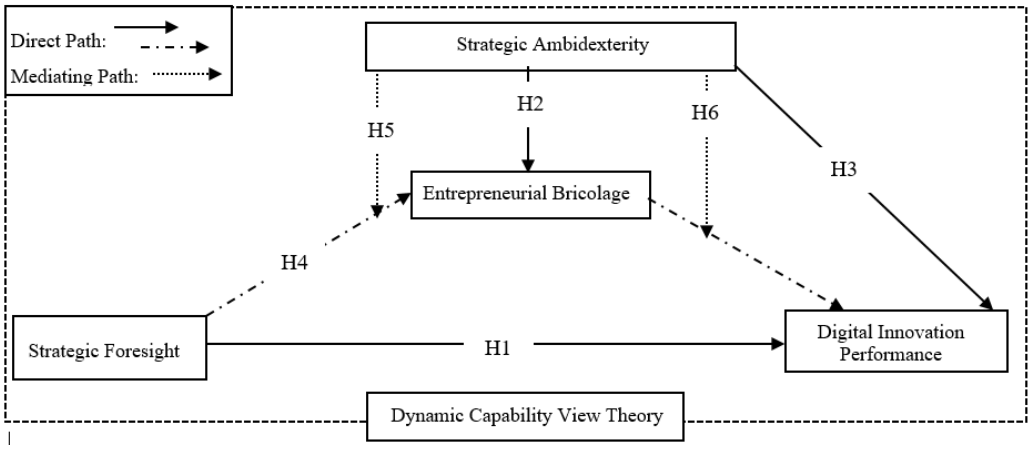
(H5): Strategic ambidexterity moderates the relationship between strategic foresight and entrepreneurial bricolage.

Chen, Pu [61] revealed that firms can maximize the benefits of bricolage when they continue to explore new digital technologies while exploiting current capabilities for efficiency. Without this balance, the impact of bricolage may be limited to short-term survival rather than contributing to

sustainable digital performance. In F-OSBs with limited resources, understanding the balance between exploration (innovating new digital tools) and exploitation (efficient use of existing resources) is crucial [62]. DCVT suggests that F-OSBs that continuously reconfigure their resources and capabilities are better equipped to navigate dynamic competitive landscapes and gain digital innovation benefits from entrepreneurial bricolage. So, based on the above rationale, the following hypothesis is proposed:

(H6): Strategic ambidexterity moderates the relationship between entrepreneurial bricolage and DIP.

CONCEPTUAL FRAMEWORK



MATERIAL AND METHODS

This study used a cross-sectional survey method to collect data from female entrepreneurs managing bricolage capabilities, which can enable ambidextrous organizations to recombine existing resources in novel ways to drive innovation and innovation among F-OSBs. This study employed non-probability purposive sampling to gather responses from female entrepreneurs designated as C.E.Os, chairwomen, and managing directors in their F-OSBs. These specific roles were targeted because the participants had a comprehensive understanding of strategic and operational aspects and the authority to make critical decisions and drive digital innovation. To collect data from F-OSBs, this study set the following criteria: I) The respondent's family owns 50% or more ownership shares; II) The firm must have operated for at least five years; III) A woman must lead the firm in a top management position; IV) The firm should have 6 to 49 full-time employees; V) Annual revenue should range from 3 to 40 million SAR; VI) Two or more family members must be involved in the business [63]. After establishing the criteria for selecting the F-OSBs, we also set criteria for selecting respondents. The criteria are as follows: I) Hold a top management position in the family business (e.g., CEO, managing director, chairperson); II) Be actively involved in the firm's operational and strategic decisions; III) Have IT certifications or a university-level degree [64].

The list of family-owned businesses was obtained from the Chamber of Commerce offices in the selected cities. The researcher called each F-OSB's main office and requested to speak with the female leader/owner. Initial screening questions were asked to verify if the firm met the required criteria. Once the eligibility was established, the researcher explained the purpose of the study and obtained consent for participation. Thus, a list of 356 F-OSBs keen to participate in the survey was finalized.

The survey questionnaire was close-ended and consisted of two parts. The first part collected respondents' demographic information and F-OSB characteristics, while the second part included measures for the study constructs. The questionnaire was distributed through e-mail or WhatsApp so the respondents could complete it conveniently. The researcher received 308 back with a response rate of 86%. After scrutiny, 47 questionnaires were discarded. The details and reasons for discarding these responses are as follows: seven respondents were not designated as CEO, managing directors,

or chairwomen, the life span of 14 F-OSBs was lower than five years, 12 respondent's families had a share lower than 50%, the number of employees in 14 F-OSBs was greater than 49. So, the final number of questionnaires used to collect the data was 261.

This study collected primary data at one point in time using a close-ended questionnaire. Hence, the potential for common method bias (CMB) was high. Therefore, two steps were taken to overcome the CMB. First, the researcher employed a marker variable, 'colour blue' in the scale measurement section of the questionnaire. However, no correlation was found between the color blue and the observed variables of this study. Second, Harman's single-factor test was implemented to test if one factor explains most of the variance in the collected data. It was found that no single factor had a variance of more than 38.1%, which is lower than 50%. So, based on these two tests, it can be deduced that no CMB exists.

The scales used in this study to measure the constructs were adopted from research articles of well-indexed journals. Five-point Likert scale ranging from 1 (not at all) to 5 (always) was employed to measure the respondent's response. The exogenous constructs strategic foresight consisted of six dimensions: framing (1 item), scanning (1 item), forecasting (3 items), visioning (2 items), acting (3 items), and planning (1 item) was adopted from [65]. The endogenous construct DIP, which consisted of 7 items, was adopted from [66]. The strategic ambidexterity, a moderating variable, consisted of two dimensions: planned strategy process (6 items) and autonomous strategy process (3 items). This scale was adopted from [67]. The mediating construct, entrepreneurial bricolage, adopted [68] consisted of eight items. The details of these scales are provided in Annexure A.

RESULTS

A descriptive analysis was conducted to understand the characteristics of the respondents and the F-OSBs. The results revealed that 48% of the top female executives were 30-40, 33% were in the 41-50 age bracket, and 19% were above 50. Regarding educational background, 67% of the respondents had a bachelor's degree, 32% had a master's degree, and 1% had a Ph.D. degree. The researcher found that 49% of F-OSBs belonged to 1st generation, 32% of F-OSBs belonged to 2nd generation, 14% to 3rd, and 5% to 4th generation. In addition, 29% had IT certifications, while 71% had University degrees.

The empirical model of this study consists of four constructs: strategic foresight, innovation bricolage, strategic ambidexterity, and DIP. These constructs were treated as reflective measurement constructs. Reflective constructs assume that the indicators (items) are a function of the latent construct and that the indicators are interchangeable, highly correlated, and share a common theme. The empirical model's measurement consisted of two stages: 1) measurement model evaluation and 2) structural model assessment.

The measurement model is evaluated by testing the indicator loading, internal consistency, convergent validity, and discriminant validity. Table 1 shows the results of indicator loading, indicating that all items loaded significantly on their respective constructs, with loading values exceeding the recommended threshold of 0.40 in social science studies. The internal consistency of each scale was evaluated using composite reliability (CR) and Cronbach's alpha. The results revealed that the CR value of the construct ranged from 0.761 to 0.867, while Cronbach's alpha values ranged from 0.687 to 0.856. This indicates that the scales have high internal consistency. The convergent value is assessed using the average variance extracted. The AVE values were found between 0.501 to 0.785. These values are higher than the recommended threshold of 0.50, indicating that the constructs exhibit good convergent validity [69].

Table 1: Reliability and Validity

Firs-order constructs	Second-order constructs	Items	Factor Loading	AVE	CR	α	Collinearity
Digital		DIP1	0.575	0.534	0.797	0.718	2.451
Innovation		DIP2	0.805				1.135
Performance		DIP3	0.631				2.632

		DIP4	0.492				1.712
		DIP5	0.790				2.418
		DIP6	0.740				1.792
		DIP7	0.496				1.831
Entrepreneurial		EB1	0.618	0.513	0.825	0.821	2.255
Bricolage		EB2	0.637				3.120
		EB3	0.754				2.241
		EB4	0.619				2.818
		EB5	0.759				1.682
		EB6	0.715				1.433
		EB7	0.704				2.241
		EB8	0.649				3.098
Autonomous		ASP1	0.893	0.658	0.762	0.738	2.510
Strategy Process		ASP2	0.763				2.633
		ASP3	0.771				1.120
Planned		PSP1	0.731	0.566	0.858	0.847	2.438
Strategy Process		PSP2	0.757				2.481
		PSP3	0.792				2.971
		PSP4	0.753				2.735
		PSP5	0.736				1.927
		PSP6	0.745				2.984
Strategic	Autonomous Strategy Process		0.428				2.191
Ambidexterity	Planned Strategy Process		0.643				1.928
Framing		FRM1	1.000				---
Scanning		SCN1	1.000				---
Forecasting		FRC1	0.642	0.516	0.761	0.728	2.146
		FRC2	0.772				2.427
		FRC3	0.735				1.175
Planning		PLN1	1.000				---
Visioning		VIS1	0.885	0.785	0.748	0.856	0.687
		VIS2	0.844				2.533
Acting		ACT1	0.798	0.605	0.818	0.687	1.203
		ACT2	0.834				2.232
		ACT3	0.681				1.932
	Strategic	Framing	0.755	0.501	0.867	0.807	1.672
	Foresight	Scanning	0.821				2.434
		Forecasting	0.673				2.679
		Planning	0.688				2.076
		Visioning	0.742				1.292
		Acting	0.917				2.192

Source: Author's own Calculation- PLS-SEM measurement model output

The discriminant validity was evaluated using the Hetero-trait Mono-trait ratio. Rönkkö and Cho [70] revealed that HTMT values should be below the recommended threshold of 0.90, confirming that the constructs are distinct. Table 2 shows that the HTMT values of each constraint are below the reference value of 0.90, suggesting adequate discriminant validity.

Table 2: Heterotrait-Monotrait Ratio of Correlations (HTMT)

Construct	DIP	EB	SA	SF
Digital Innovation Performance				
Entrepreneurial Bricolage	0.714			
Strategic Ambidexterity	0.642	0.899		
Strategic Foresight	0.659	0.710	0.816	

Note: SF= Strategic Foresight; DIP= Digital innovation performance; SA= Strategic Ambidexterity; EB=Entrepreneurial Bricolage
Source: Author's own calculation- PLS-SEM measurement model output

The structural model was tested to evaluate the hypothesized relationships among the latent constructs. Therefore, a boot-strapping procedure was performed with 5000 subsamples to assess

the significance of the path coefficients. A two-tailed test was employed to determine the importance of the paths at 0.05 level. The measurement of the model was assessed based on the following indicators: path coefficients (beta values), t-values, R2 value, and Q2 predictive relevance. Table 3 shows the direct relationships between the constructs. The results show that strategic foresight has a positive relationship with DIP (H1: β= 0.311, t= 6.308, P=0.000), thus supporting H1. The strategic ambidexterity has a positive relationship with entrepreneurial bricolage (H2: β= 0.728, t= 23.106, P=0.000) and DIP (H3: β= 0.432, t= 7.918, P=0.000).

Table 3: Direct Path

Hypothesis	Path	Beta	T-value	P-value	Decision	CI LL/UL
H1	SF→DIP	0.311	6.308	0.000	Accepted	[0.214/0.409]
H2	SA→EB	0.728	23.106	0.000	Accepted	[0.665/0.788]
H3	SA→DIP	0.432	7.918	0.000	Accepted	[0.324/0.541]

Note: SF= Strategic Foresight; DIP= Digital innovation performance; SA= Strategic Ambidexterity; EB=Entrepreneurial Bricolage
P is significant at 0.05 (2-tailed); SD= Standard Deviation; CI=Confidence Intervals; LL=Lower Limit; UL=Upper Limit
Source: Author's own calculation- PLS-SEM measurement model output

Table 4 provides the mediating and moderating path analysis. The results of H4 show that entrepreneurial bricolage mediates the relationship between strategic foresight and DIP (H4: β= 0.049, t= 2.054, P=0.040), thus supporting this hypothesis. The results of H5 show that strategic ambidexterity does not moderate the relationship between strategic foresight and entrepreneurial bricolage (H5: β= 0.029, t= 1.247, P=0.161), so the H5 hypothesis is rejected. While the results of H6 show that strategic ambidexterity moderates the relationship between entrepreneurial bricolage and DIP (H6: β= 0.107, t= 5.465, P=0.000), H6 is accepted.

Table 4: Mediating And Moderating Path

Hypothesis	Path	Beta	T-value	P-value	Decision	CI LL/UL
H4	SF→EB→DIP	0.049	2.054	0.040	Accepted	[0.010/0.103]
H5	SF*SA→EB	0.029	1.247	0.161	Rejected	[-0.004/0.089]
H6	EB*SA→DIP	0.107	5.465	0.000	Accepted	[0.064/0.140]

Note: SF= Strategic Foresight; DIP= Digital innovation performance; SA= Strategic Ambidexterity; EB=Entrepreneurial Bricolage
IB=Innovation Bricolage: *P is significant at 0.05 (2-tailed)
Source(s): Authors' work – PLS-SEM structural model output

Figure 1 shows the overall picture of the statistical model of this study.

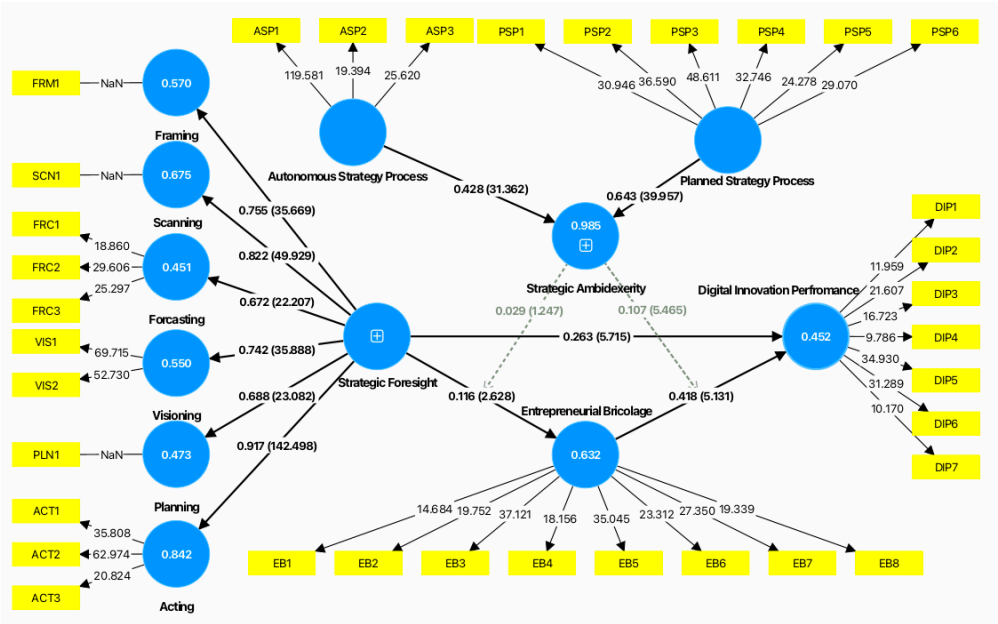


Figure1: Statistical Model

Table 5 shows the constructs' predictive relevance. Henseler et al. 2015 suggested that values 0.35, 0.15, and 0.02 have large, medium, and small effect sizes, respectively. So, it can be deduced that DIP, entrepreneurial bricolage, and strategic ambidexterity have small, medium, and large effect sizes, respectively.

Table 5: Predictive Relevance

Constructs	R^2	Q^2	Predictive Power
Digital Innovation Performance	0.452	0.177	Small
Entrepreneurial Bricolage	0.632	0.296	Medium
Strategic Ambidexterity	0.882	0.469	Large

R^2 =Coefficient of Determination; Q^2 =Predictive Relevance
Source(s): Authors' work – PLS-SEM structural model output

Figure 2 shows that female entrepreneurs with high-level strategic ambidexterity who use strategic foresight are less likely to perform innovative activities. So, it can be deduced that F-OSBs with high strategic ambidexterity, despite having strategic foresight, cannot maintain innovative capabilities to ensure short-term adaptability and long-term resilience.

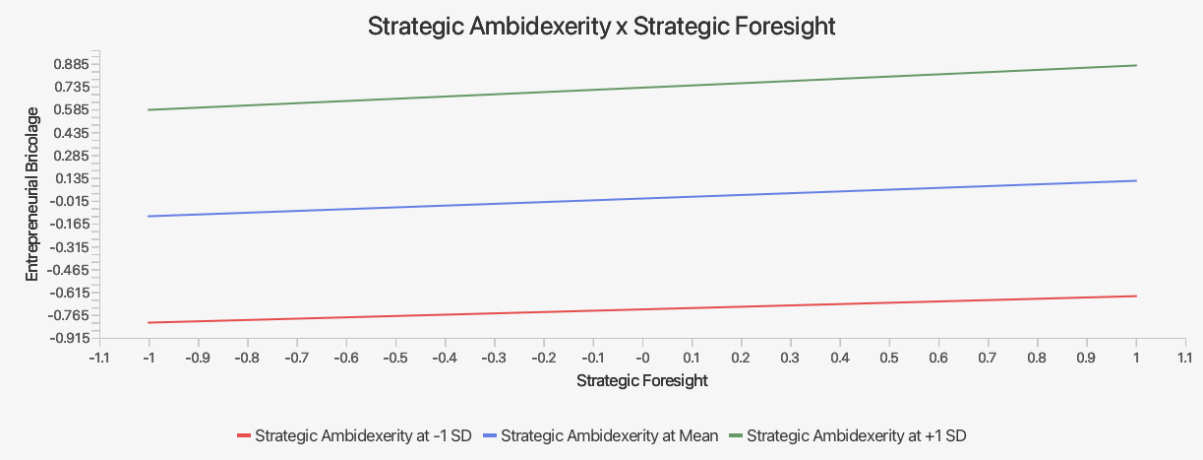


Figure 2: Strategic Ambidexterity Moderation Between Strategic Foresight and Digital Innovation Performance

Figure 3 reveals that female entrepreneurs who are highly inclined to explore new opportunities and exploit existing capabilities (strategic ambidexterity) use their available resources effectively (entrepreneurial bricolage) and achieve DIP. Conversely, a low level of strategic ambidexterity in F-OSBs less gain from bricolage, which indicates that balancing innovation exploration and exploitation is crucial in F-OSBs to achieve high DIP.

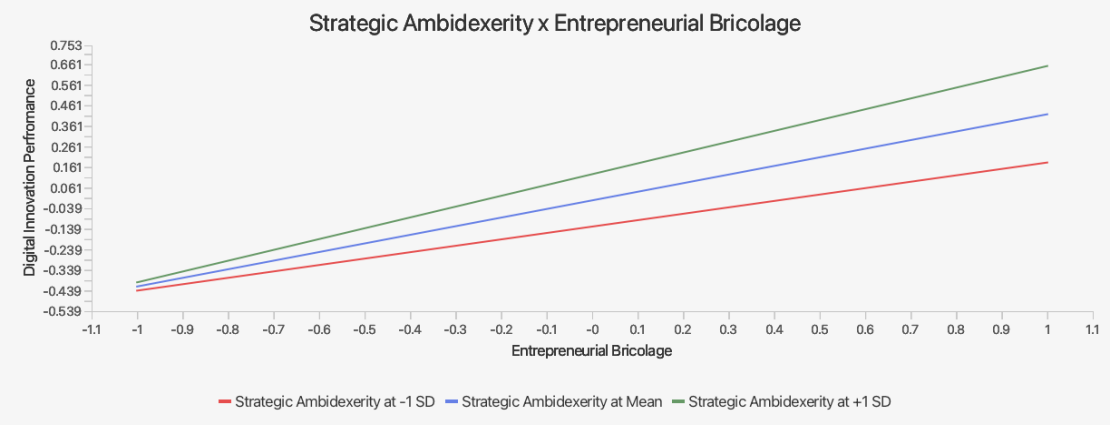


Figure2: Strategic Ambidexterity Moderation Between Entrepreneurial Bricolage and Digital Innovation Performance

This study offered direct, mediating, and moderating evidence of the relationships between strategic foresight, entrepreneurial bricolage, strategic ambidexterity, and DIP in F-OSBs.

DISCUSSION

The direct path analysis (H1) results supported that strategic foresight positively correlates with DIP. The findings Del Giudice, Scuotto [71] align with this study, as firms with a long-term vision and the ability to predict future shifts in their industries are more successful in adapting their innovation procedures and devices. The lens of DCVT helps explain that Saudi female entrepreneurs with strategic foresight are better equipped to sense the limitations and restrictions imposed by their family members and develop strategies to seize the available opportunities. In addition, Saudi female entrepreneurs have strategic foresight to navigate complex socio-cultural constraints, minimize the digital skills gap, and effectively utilize the available resources to create innovative digital solutions and apply them in their F-OSB operations. Thus, they can achieve a superior DIP.

The results of H2 show that strategic ambidexterity has a positive relationship with entrepreneurial bricolage. These findings also align with [72], who showed that ambidextrous organizations can mobilize internal resources through bricolage to achieve competitive advantage. The lens of DCVT enlightens that strategic ambidexterity is a higher-order dynamic capability that empowers female entrepreneurs to persistently adapt and coordinate their innovative efforts, balancing exploration and exploitation to create and enhance digital solutions. F-OSBs that master the strategic ambidexterity approach are more inclined to utilize bricolage to creatively leverage existing resources, generate novel ideas, and achieve superior DIP.

The results of H3 indicate that strategic ambidexterity has a positive relationship with DIP. These findings Clauss, Kraus [73] showed that companies achieving superior performance adapt their organizational structures, processes, and cultures to simultaneously pursue exploratory and exploitative innovation activities. The DCVT suggests that strategic ambidexterity enables female entrepreneurs in F-OSBs to sense external changes, seize new opportunities, and reconfigure their internal resources and processes. This, in turn, allows them to develop and deploy innovative digital solutions quickly and efficiently, resulting in enhanced DIP.

H4 revealed that entrepreneurial bricolage mediates the relationship between strategic foresight and DIP. Wu, Sun [74] are in line with these results, who found that a future-oriented mindset and resource-based constraints prompt entrepreneurs to develop cost-effective products and explore creative digital solutions. The lens of DCVT enlightens that entrepreneurial bricolage helps translate their proactive strategies into practical digital innovations, overcoming limitations like capital shortages and conservative business practices. By leveraging both foresight and bricolage, despite deep-rooted cultural values, these F-OSBs can enhance their DIP, aligning with DCV's emphasis on adaptability and resilience in resource-constrained environments.

The results of H5 revealed that strategic ambidexterity does not moderate the relationship between strategic foresight and entrepreneurial bricolage. Jia, Hu [75] also argued that strategic ambidexterity works in a complex organizational design that enables firms to engage in exploitative and exploratory innovation simultaneously. DCVT enlightens that building strategic ambidexterity is challenging for family firms, as they often struggle with the tension between family and business goals. Therefore, in Saudi Arabian F-OSBs, where family dynamics and patriarchal cultural norms prevail, strategic foresight may not necessarily lead to entrepreneurial bricolage when the organization lacks the structural and contextual conditions to balance exploration and exploitation.

H6 showed that strategic ambidexterity strengthens the relationship between entrepreneurial bricolage and digital innovation performance. Ferreira, Cardim [76] also supported this finding and revealed that, organizations must manage exploration (innovation) and exploitation (efficiency) activities to sustain competitive advantage. The lens of DCVT enlightens that female entrepreneurs in Saudi Arabia who can balance exploration and exploitation simultaneously are more likely to effectively utilize their limited resources through innovation bricolage and, in turn, enhance DIP.

CONCLUSION, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

The current study offers several theoretical implications to the literature on digital innovation and family business management in several important ways. First, it extends the literature by investigating the role of female entrepreneurs' strategic foresight toward the DIP of F-OSBs. Previous studies have examined the role of strategic foresight in large firms and explored its impact on a firm's performance [77]; however, how the female entrepreneur's strategic foresight shapes the DIP in F-OSBs remained under research. F-OSBs have to confront limited access to capital, societal restrictions, and a scarcity of skilled digital labor [78]. So, this study offers unique insights into the strategic behaviors and capabilities that enable female entrepreneurs to drive digital innovation in resource-constrained environments. Second, the study adds to the limited literature on the mediating role of entrepreneurial bricolage in the strategic foresight-digital innovation performance linkage. Previous studies have investigated bricolage as a resourceful tool to manage resource constraints in new ventures, but its importance in established family firms with traditional business models was less explored [79]. So, this study sheds light on how female entrepreneurs utilize innovation bricolage as a key mechanism to transform their strategic foresight into tangible digital innovation outcomes. Third, this study extends the understanding of strategic ambidexterity as a boundary condition and reveals how it moderates the relationship between strategic foresight, entrepreneurial bricolage, and DIP. Previous studies have examined strategic ambidexterity in organizations with balanced and structured mechanisms supporting innovation adoption in firms' operations. However, this study examined how female entrepreneurs in resource-constrained environments apply ambidextrous strategies to balance their exploratory and exploitative innovation efforts and leverage their limited resources to enhance their DIP. This study tailored the understanding of how female entrepreneurs navigate challenges, seize opportunities, and foster digital innovation within their unique socio-cultural and business environments [80]. Fourth, the DCVT provides a robust theoretical lens to explain how sensing, seizing, and reconfiguring based on strategic foresight capabilities of female entrepreneurs shape DIP in a conservative Saudi environment through the mediating role of entrepreneurial bricolage and the moderating role of strategic ambidexterity.

This study offers several practical implications for female entrepreneurs managing their family businesses and policymakers: First, female entrepreneurs should focus on developing their strategic foresight capabilities to scan external environments, anticipate emerging digital trends and customer needs, and create a long-term strategic vision. So, by fostering such capabilities, they can equip themselves to identify new digital opportunities, make informed investment decisions, and adapt their business models accordingly, even in the comparatively conservative culture of Saudi Arabia. Second, this study highlights that female entrepreneurs should be empowered to combine and recombine their existing assets in novel ways to develop innovative digital solutions despite being paralyzed by a lack of financial, technological, or human resources. Thus, cultivating a bricolage mindset and training can increase female entrepreneurs' resourceful problem-solving abilities and enhance their DIP. Third, strategic ambidexterity has been commonly touted as critical for innovation, and it might not benefit in resource-constrained environments. So, female entrepreneurs should thoughtfully assess when and how to balance exploration and exploitation activities, as an excessive focus on efficiency and control may inadvertently stifle the flexibility and creativity required for successful digital innovation. Fourth, policymakers should support nurturing female entrepreneurs' creativity and encourage their visionary leadership capabilities in regions with limited resources. Fifth, policymakers should encourage entrepreneurial ecosystem actors to develop a mechanism to provide funding, mentorship, and training to resource management to enhance female entrepreneurs' potential to drive innovative digital activities. Overall, this study offers a nuanced understanding of the strategies and capabilities that enable female entrepreneurs in F-OSBs to overcome socio-cultural and resource constraints and foster successful digital innovation.

Several limitations in this study present opportunities for future research. The study specifically examined Saudi Arabia, which has a distinct socio-cultural context that may restrict the applicability of the results to other countries. Future research could explore how female entrepreneurs in other Middle Eastern or developing economies utilize their strategic foresight, entrepreneurial bricolage, and strategic ambidexterity to improve DIP in F-OSBs. Secondly, this study utilized a cross-sectional design, which limits the ability to infer causality between constructs. Therefore, it is recommended to implement a longitudinal research design to obtain more robust insights. Third, primary data was collected from four major cities in Saudi Arabia, which hold economic significance. However, to ensure geographical diversity, researchers should also include smaller cities and rural areas. Fourth, researchers should investigate the impact of external partnerships, government policies, and access to capital on digital innovation performance. Fifth, this study has utilized one mediating variable, entrepreneurial bricolage, and the moderating variable, strategic ambidexterity. Subsequent studies should consider utilizing constructs such as organizational culture or digital literacy. Sixth, the study focused on female-led F-OSBs. It would be interesting to compare male-led F-OSBs or mixed-gender leadership teams to identify potential gender-based differences. This could open up the role of gender dynamics in fostering innovation within family-owned businesses.

This study sheds light on the unique challenges and opportunities faced by female entrepreneurs in F-OSBs in Saudi Arabia, a country with a relatively conservative socio-cultural environment. The results of this study affirm that female entrepreneurs who anticipate future trends can be better positioned to harness limited resources to develop innovative digital solutions. Furthermore, the findings suggest that an entrepreneurial bricolage approach, where female entrepreneurs creatively combine and recombine their existing assets, can enable DIP in a resource-constrained environment for females. Notably, the study reveals how strategic ambidexterity - balancing exploration and exploitation - strengthens the relationship between innovation bricolage and DIP. These insights provide a more nuanced understanding of the dynamic capabilities that female entrepreneurs in Saudi Arabia can leverage to drive digital innovation and competitiveness in their F-OSBs. Overall, this study offers important theoretical and practical implications.

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