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A Decision-Support Model for Enhancing Innovative Business Performance: The Role of Technological Opportunism, Supervisory Support and Innovation Culture

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ABSTRACT

This research examines the factors influencing innovative business performance by analysing how technological opportunism, supervisor support for innovation, innovation engagement, and organisational innovation culture affect managerial and organisational decision-making in innovation contexts. Employing a decision-analytic perspective and structural equation modelling using Smart PLS 3, quantitative data from the manufacturing industry were analysed. The findings indicate that technological opportunism impacts innovative business performance both directly and indirectly, highlighting the critical role of technology-related decision-making and adoption strategies. Additionally, the results demonstrate that supervisor support for innovation plays a crucial role in encouraging employees to participate in innovation activities, thereby enhancing overall innovation outcomes. The study also emphasises that an organisational culture promoting experimentation and inclusive decision-making cultivates an environment supportive of creativity and innovation. By combining insights from innovation management and decision sciences, the research suggests that effective innovation performance relies not solely on resource availability but on the quality of technological, supervisory, and cultural decision-making embedded within the organisation.

1. Introduction

In today's business environment, prioritizing innovation is critical for senior decision makers, managers, and administrators seeking to enhance innovation outcomes and pursue entrepreneurial initiatives. Despite its recognized importance, the ability to predict innovative business performance remains limited [16; 32]. Similarly, there is a paucity of knowledge regarding the antecedents of business innovation performance and related constructs [18; 45]. Strategic engagement in innovation reinforces the attainment of organizational goals and sustains competitiveness. Achieving this

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requires organizations to continually leverage technological advancements [70]. Nonetheless, the various pathways through which technology can enhance innovative business performance remain underexplored. For example, technological opportunism has been suggested as a potential key driver of innovative business outcomes, yet it has received limited empirical attention. While studies have recognized technological opportunism as a significant contributor to organizational performance [6], its specific role in driving innovative business performance has not been definitively established.

In addition, supervisor support has been identified as a vital factor in improving both individual and organizational outcomes [47]. Investigating how supervisor innovative support may influence business innovation performance represents an important, yet largely untested, avenue of research. Moreover, scholarly gaps exist concerning potential mediating and moderating factors that could further elucidate the mechanisms predicting business innovative performance. Consequently, this area warrants urgent empirical investigation. To address these gaps, the current study proposes the following research questions:

RQ1: To what extent can technological opportunism and supervisor innovative support contribute to business innovation performance?

RQ2: Does innovation engagement mediate the relationship between technological opportunism, supervisor innovative support, and business innovation performance?

RQ3: What role does innovation culture play in influencing business innovation performance, both directly and indirectly?

By addressing these questions, this research seeks to extend the existing literature on the mechanisms that underpin business innovation performance.

2. Literature Review

2.1 Theoretical Model

The Resource-Based View (RBV) Barney [13] provides a robust theoretical foundation for this study. RBV conceptualizes organizations as distinctive bundles of resources, which can be leveraged to achieve competitive advantages. Researchers exploring innovation performance and related constructs have employed RBV to elucidate how intangible resources contribute to organizations' innovation outcomes [12; 37; 66]. The framework effectively explains how the accumulation and deployment of organizational resources facilitate innovative capabilities. Accordingly, the theoretical model of the present research examines the mechanisms shaping business innovative performance by analyzing the interaction among an organization's intangible resources, including technological opportunism, supervisor support for innovation, innovation engagement, and innovation culture.

2.2 Business Innovative Performance

According to Neely and Hii [43], business innovative performance can be understood as the formulation of processes that cultivate an orientation towards innovation and enhance the outcomes of innovation-related activities. The prosperity and advancement of an organization are largely contingent upon its capacity to generate novel ideas and provide innovative solutions within its business environment. Contemporary organizations are expected to actively motivate their workforce and furnish the necessary resources to foster creativity and facilitate readiness for change. For instance, a manufacturing enterprise may enhance its performance through the acquisition of patents for distinctive products [75].

Business innovative performance is instrumental in broadening organizational opportunities and optimising overall operational effectiveness [29]. The process of innovation enriches managerial practices by integrating diverse perspectives, advanced technological knowledge, and extensive

collaborative networks, thereby transforming conceptual ideas into actionable business opportunities. External sources of knowledge and strategic partnerships are crucial in supporting the enhancement of innovative performance [10]. Such approaches not only expand the scope of business prospects but also substantially contribute to improved overall performance [39]. The effectiveness of business innovative performance is closely linked to the domain of innovation management, which encompasses the governance and optimization of innovation processes within an organization.

Innovation functions as a driver for strategic organizational actions, enabling the expansion of capabilities and the enhancement of firm size, and is therefore critical to organizational success. Strategic planning is particularly essential for small enterprises seeking to elevate their innovation performance [72]. Eco-organizational innovation represents a pivotal element of business innovative performance, enhancing both financial outcomes and competitive positioning within the market. This dimension encompasses product, process, and organisational innovations, which correspond to environmental dynamism, market-oriented practices, and adhocracy cultures. Achieving innovation ambidexterity is vital, as it allows organisations to balance exploratory and exploitative innovation activities to optimise results [5].

Consequently, business innovative performance is fundamental for managerial effectiveness and the competitive positioning of organisations. Prioritizing innovation is essential for managers, administrators, and firms aiming to strengthen innovation outcomes and pursue entrepreneurial ventures. However, leaders must judiciously balance multiple organisational priorities to ensure comprehensive attention across all operational domains. Active engagement with innovative enterprises and the exploration of advanced innovation practices are crucial for fostering a robust innovation culture. Best practice literature highlights that the allocation of resources to innovation activities generates competitive advantages, facilitates knowledge creation, and encourages experimentation. Empirical evidence indicates that organisations embracing innovation exhibit superior capability in achieving strategic objectives and sustaining competitiveness [72]. Sustained business innovative performance is critical for long-term organisational growth and viability. Nonetheless, various factors may constrain innovation potential, including market challenges, established competitors, and limited access to finance. Such barriers can impede product innovation and necessitate continuous advancement through process innovation. Therefore, organisations must strategically seek external partners to augment innovative performance via technological and financial support, thereby mitigating potential constraints and maintaining operational continuity. For example, firms in Ecuador have employed structured educational and training initiatives to cultivate their innovative capacities [75].

2.3 Technological Opportunism

Contemporary business organisations are increasingly challenged to adapt to the rapid evolution of business structures and operational processes. Research has consistently highlighted that technology plays a pivotal role in shaping business performance and organisational effectiveness. While prior studies emphasize the significance of technology, there remains a need to examine the broad spectrum of technological opportunities, referred to as “technological opportunism.” Traditional enterprises are investing in technology to enhance e-business processes, thereby improving performance and adapting to both global and local market fluctuations. The expansion of e-business offers IT-enabled capabilities that support business operations and facilitate growth within competitive markets [62, 69]. Technological utilization promotes information sharing, coordination across supply chains, and the provision of digital services to stakeholders, thereby fostering competitive advantages in procurement, channel management, service delivery, and overall

stakeholder engagement [3].

According to Li et al. [6], technological opportunism provides firms with avenues for growth, competitive positioning, and the enhanced capitalization of business operations. Complementing this perspective, studies have emphasize the importance of focusing on the development of individual e-business processes rather than treating the entire technological system as a monolithic entity [69]. Following Srinivasan et al. [62], this study defines technological opportunism as an organisational approach that facilitates the rapid identification and adoption of technological advancements that are appropriate for the business context. The practical application of technological opportunism aligns closely with the principles of resource orchestration theory [6], which highlights the strategic development of e-business capabilities to integrate inter-firm processes and enhance organisational value and performance. Empirical evidence suggests that leveraging e-business processes allows firms to identify and exploit technological innovations and business opportunities effectively. Consequently, technological opportunism should not be confined to a single operational process but rather integrated across procurement, channel management, delivery, and supply chain activities, thereby maximizing the benefits of technology and enhancing organisational performance in competitive global markets.

The significance of technological opportunism is further supported by research indicating that firms capable of exploiting technological opportunities are better positioned to analyse markets and implement disruptive innovations that transform business operations [69]. Emphasizing technological opportunities encourages firms to adopt proactive strategic approaches [62; 74]. Technology mitigates uncertainties in interactions, facilitates proactive engagement with market-oriented strategies, and maintains the organization in a continuous state of learning and improvement, thereby enhancing competitiveness. This underscores the necessity of developing processes that integrate technological responsiveness with market orientation, ensuring more efficient, effective, and adaptive business operations.

2.4 Supervisor Innovative Support

Supervisor support encompasses the facilitation, recognition, and endorsement provided by an immediate managerial authority. Prior research has emphasized the critical role of supervisor support in influencing both individual and organisational outcomes [2; 56; 73]. These studies indicate that support from supervisors instils confidence in employees and acknowledges their contributions, ultimately enhancing performance outcomes [46; 73]. Building on this conceptual foundation, the present study operationalises supervisor innovative support as the provision of assistance, facilitation, and recognition by immediate supervisors towards subordinates' innovative ideas and initiatives. Drawing upon established empirical evidence regarding the beneficial effects of supervisor support Joel et al. [34], it is posited that supervisor innovative support will foster employee engagement and, in turn, positively influence business innovative performance. Accordingly, the following hypothesis was tested:

H1: There is an association between Innovation Culture and Business Innovative Performance.
H2: There is an association between Innovation Engagement and Business Innovative Performance.
H3: There is an association between Supervisor Innovative Support and Innovation Engagement.
H4: There is an association between Supervisor Innovative Support and Business Innovative Performance.
H5: There is an association between Technology Opportunism and Innovative Engagement.
H6: There is an association between Technology Opportunism and Business Innovative Performance.

2.5 Mediation of Innovation Engagement

Employee engagement is widely recognized as a critical factor in enhancing individual, work-

related, and organisational outcomes [21]. Engagement is conceptualized as a psychological state characterised by energy, absorption, and dedication towards work tasks [4; 58]. Drawing on this understanding, the present study defines innovation engagement as the degree of employees' immersion, dedication, and vigour in activities related to innovation. Previous research has emphasised the importance of innovation in strengthening organisational outcomes [76]. This emphasis has become increasingly pertinent in the context of rapid technological advancement and heightened competitive pressures within contemporary business environments [35]. Additionally, empirical studies have identified innovation engagement as a crucial factor in fostering organisational performance [40]. Despite this, there remains limited understanding regarding its potential mediating role in the context of social and technology-related organisational studies, highlighting a significant research gap. Prior investigations have demonstrated that innovation-related constructs often function as intervening variables [67], and several studies have also explored how different facets of engagement mediate various organisational relationships [38; 74]. Accordingly, the present study posits that innovation engagement may serve as a mediator in the examined relationships. Based on this premise, the following hypotheses were tested:

H7: The relation between Technology Opportunism and Business Innovative Performance is mediated by Innovation Engagement.

H8: The relation between Supervisor Innovative Support and Business Innovative Performance is mediated by Innovation Engagement.

2.6 Innovation Culture and Its Moderation

In today's rapidly evolving environment, characterized by technological advancements, shifting customer expectations, and intensified global competition, organisations face mounting pressure to transform their operational and business models to secure sustainable competitive advantage. A strong organisational culture has been shown to exert significant effects, including enhanced employee commitment, organisational citizenship behavior, and ambidextrous leadership, all of which contribute to improved organisational performance [64]. Research suggests that fostering innovation within business processes and operations represents a key strategy for adapting to dynamic environments and achieving sustainable competitive advantage [1; 44; 53].

However, integrating innovation into organisational processes is challenging without cultivating a culture underpinned by shared values and beliefs. Such a culture encompasses activities and support mechanisms that facilitate open communication, the exchange of ideas, and the generation of novel solutions, thereby encouraging employees to develop creative outcomes [15; 20; 71]. Innovation culture is conceptualized as a collective set of values and beliefs that foster openness to novel ideas and encourage innovation within organisations [17]. Previous studies have emphasised its critical role in enhancing organisational outcomes [14; 51]. A culture that actively promotes innovation also reinforces employee empowerment, accountability, and the sustainable pursuit of innovative initiatives [52; 57]. Evidence indicates that when employees are engaged and committed to innovation-related activities, organisational performance improves [19; 33]. Consequently, innovation culture serves a dual function: it drives organisational-level innovation while simultaneously harnessing employees' psychological resources, particularly engagement, thereby supporting organisational competitiveness and adaptability [3; 46]. Based on this rationale, the following hypothesis was tested:

H9: The relation between Innovation Engagement and Business Innovative Performance relationship is moderated by Innovation Culture.

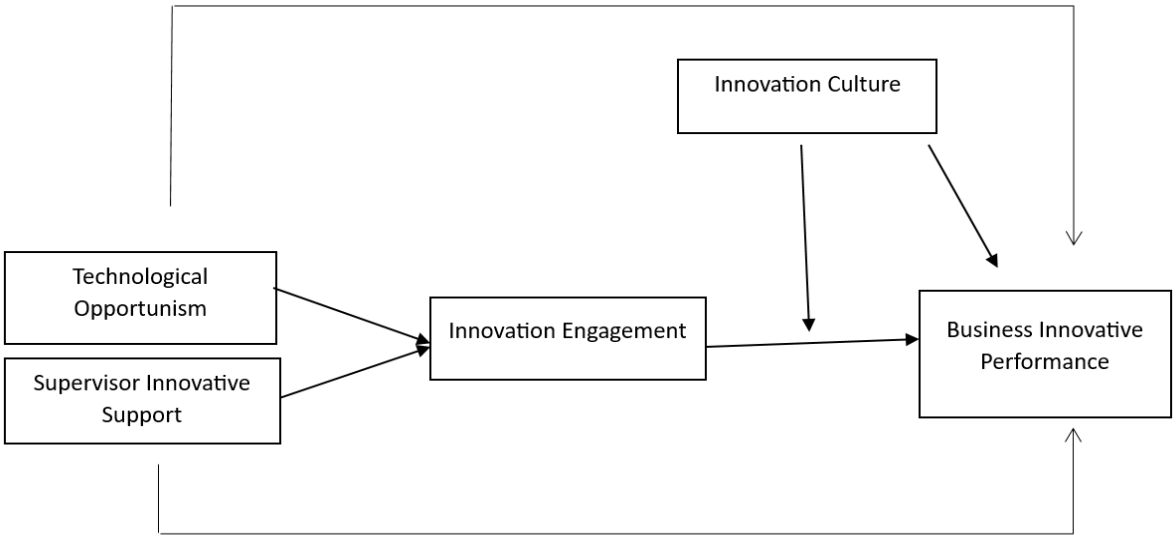

Fig.1: Research Model

3. Sampling

To test the model of the current study shown in Figure 1, the data were collected from managerial personnel within manufacturing firms in Bahrain. Information regarding these firms was sourced from comprehensive online business databases and analytical resources. From an initial pool of 186 firms, 120 leading manufacturing companies with advanced technological capabilities were selected. Email invitations were sent to the targeted managers, complemented by individual visits and telephonic follow-ups where feasible, in order to optimise the response rate. Employing a cross-sectional research design, a total of 360 questionnaires were distributed, of which 311 were returned completed. Following rigorous data screening and validation procedures, 257 responses were retained for final analysis and interpretation. This corresponds to a valid response rate of 71.3 per cent, which is considered satisfactory for survey-based research [60].

3.1 Instrumentation

The study operationalised innovation engagement using the 9-item UWES [59]. Technological opportunism was evaluated through an 8-item scale adapted from Srinivasan et al. [62], whereas supervisor innovative support was measured with a three-item scale from [48]. Innovation culture was assessed using a 4-item scale developed by Martins and Terblanche [42], and innovative business performance was captured via a nine-item scale adapted from [7; 41].

4. Data Analysis

SEM was employed using Smart PLS 3 Ringle et al. [55] to examine the relationships among technological opportunism, supervisor innovative support, innovation engagement, innovation culture, and business innovative performance. Partial least squares SEM (PLS-SEM) has gained considerable recognition and is increasingly adopted as a methodological approach for testing structural models. Recent studies indicate that PLS-SEM is emerging as a compelling alternative for complex analytical procedures [8].

4.1 Common Method Variance

In behavioural research, CMV arises when measurement error stems from the data collection method rather than the constructs themselves [49]. As self-administered surveys can introduce such bias [49; 61], this study implemented procedural remedies recommended by [50] and [68]. To assess

CMV, the Harman single-factor test and principal component factor analysis were conducted, revealing a cumulative variance of 43.693%, with the largest factor accounting for 14.419%, well below the 50% threshold [36]. This indicates that CMV does not pose a significant threat to the study's findings.

4.2 Assessment of Measurement Model

The measurement model was evaluated using the two-step approach proposed by [9]. Initially, validity and reliability were assessed. Factor loadings exceeding 0.50 were deemed acceptable Bagozzi and Yi [11], with items below this threshold removed; in this study, only IE8 was excluded [26].

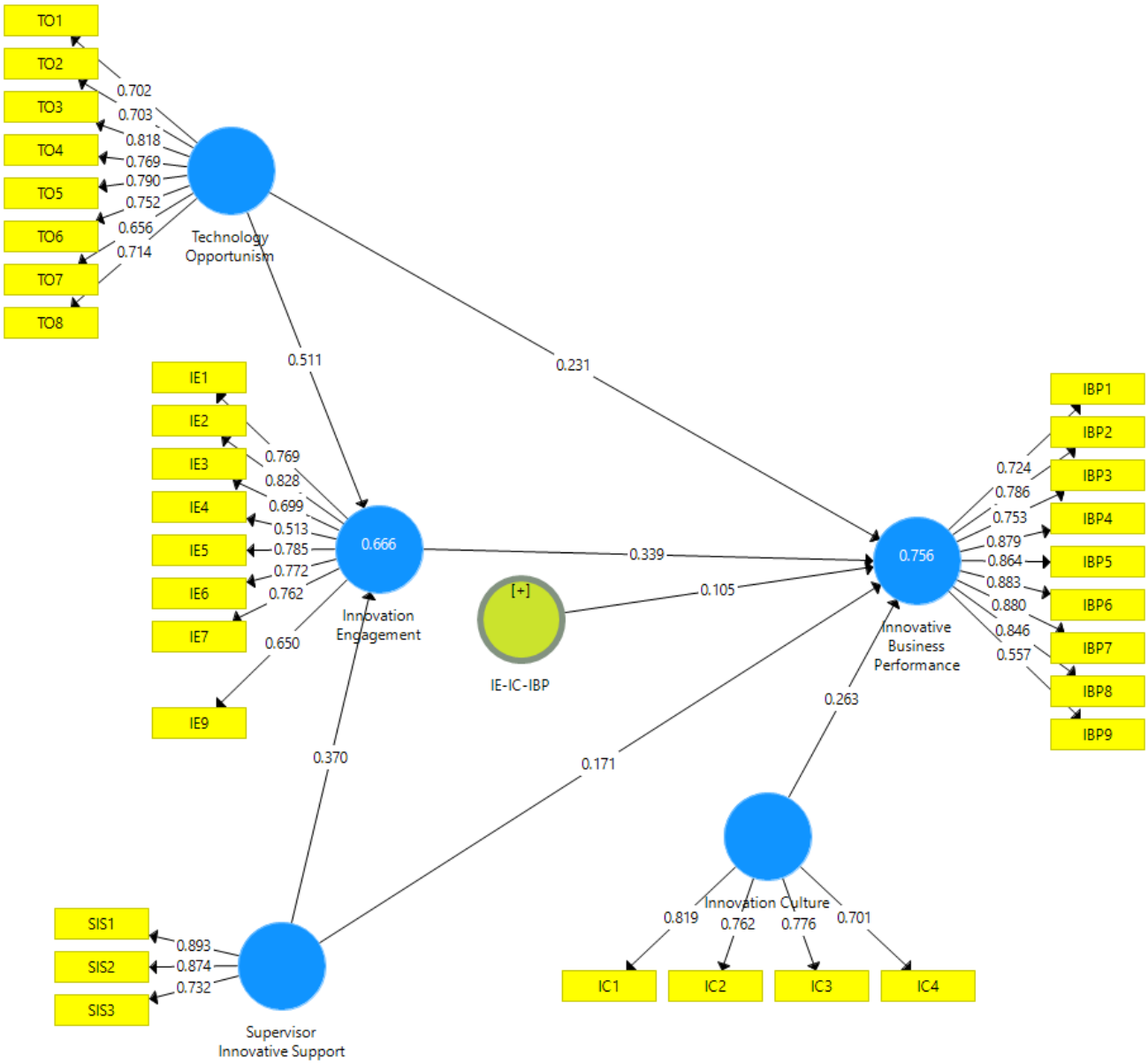

Fig.2: Measurement Model

Reliability was assessed via composite reliability, requiring a minimum of 0.70 [23], and the Average Variance Extracted (AVE) was examined with a threshold of 0.50 [22]. Results confirmed that the model achieved satisfactory reliability and validity. Full details are provided in Table 1 and Figure 2.

Table 1
Reliability and Validity Assessment (n=280)

Construct	Loading	CR	AVE
Innovative Business Performance		0.942	0.645
IBP1	0.724		
IBP2	0.786		
IBP3	0.753		
IBP4	0.879		
IBP5	0.864		
IBP6	0.883		
IBP7	0.880		
IBP8	0.846		
IBP9	0.557		
Innovative Culture		0.850	0.586
IC1	0.819		
IC2	0.762		
IC3	0.776		
IC4	0.701		
Innovation Engagement		0.899	0.531
IE1	0.769		
IE2	0.828		
IE3	0.699		
IE4	0.513		
IE5	0.785		
IE6	0.772		
IE7	0.762		
IE9	0.650		
Supervisor Innovative Support		0.874	0.699
SIS1	0.893		
SIS2	0.874		
SIS3	0.732		
Technological Opportunism		0.906	0.547
TO1	0.702		
TO2	0.703		
TO3	0.818		
TO4	0.769		
TO5	0.790		
TO6	0.752		
TO7	0.656		
TO8	0.714		

Note: *IE8 was deleted due to low factor loading.

4.3 Assessment of Discriminant Validity

In this study, discriminant validity was evaluated using the HTMT as proposed by [30]. The recommended threshold for HTMT varies across the literature, with Rb [54] suggesting a value of 0.85, while other scholars recommend 0.90 [25; 65]. Based on these criteria, the present study demonstrates adequate discriminant validity. Detailed HTMT results are shown in Table 2.

Table 2
(HTMT Criteria) Discriminant Validity

	IC	IE	IBP	SIS	TO
IC	==				
IE	0.530	==			
IBP	0.667	0.879	==		
SIS	0.571	0.893	0.852	==	
TP	0.500	0.877	0.817	0.856	==

4.4 Assessment of Structural Model

In the present study, both direct and indirect relationships were examined. The model was

evaluated using a bootstrapping procedure with 5,000 resamples, applying a significance criterion of $p \leq 0.05$ in accordance with [28].

To evaluate the indirect relationships, a bootstrapping procedure with 5,000 resamples was employed [28]. The study's hypotheses were grounded in prior literature, with direct paths conceptualised between technological opportunism, supervisor innovative support, and innovative business performance via innovation engagement. The analysis revealed that innovation engagement significantly mediated the relationship between technological opportunism and innovative business performance ($\beta = 0.174$, $t = 3.543$, $p < 0.001$). Similarly, innovation engagement also mediated the association between supervisor innovative support and innovative business performance ($\beta = 0.126$, $t = 4.232$, $p < 0.001$). Additionally, the results indicated a significant moderating effect of innovation culture on the relationship between innovation engagement and innovative business performance ($\beta = 0.105$, $t = 3.631$, $p < 0.001$), highlighting the role of a supportive organisational culture in strengthening the impact of engagement on innovation outcomes.

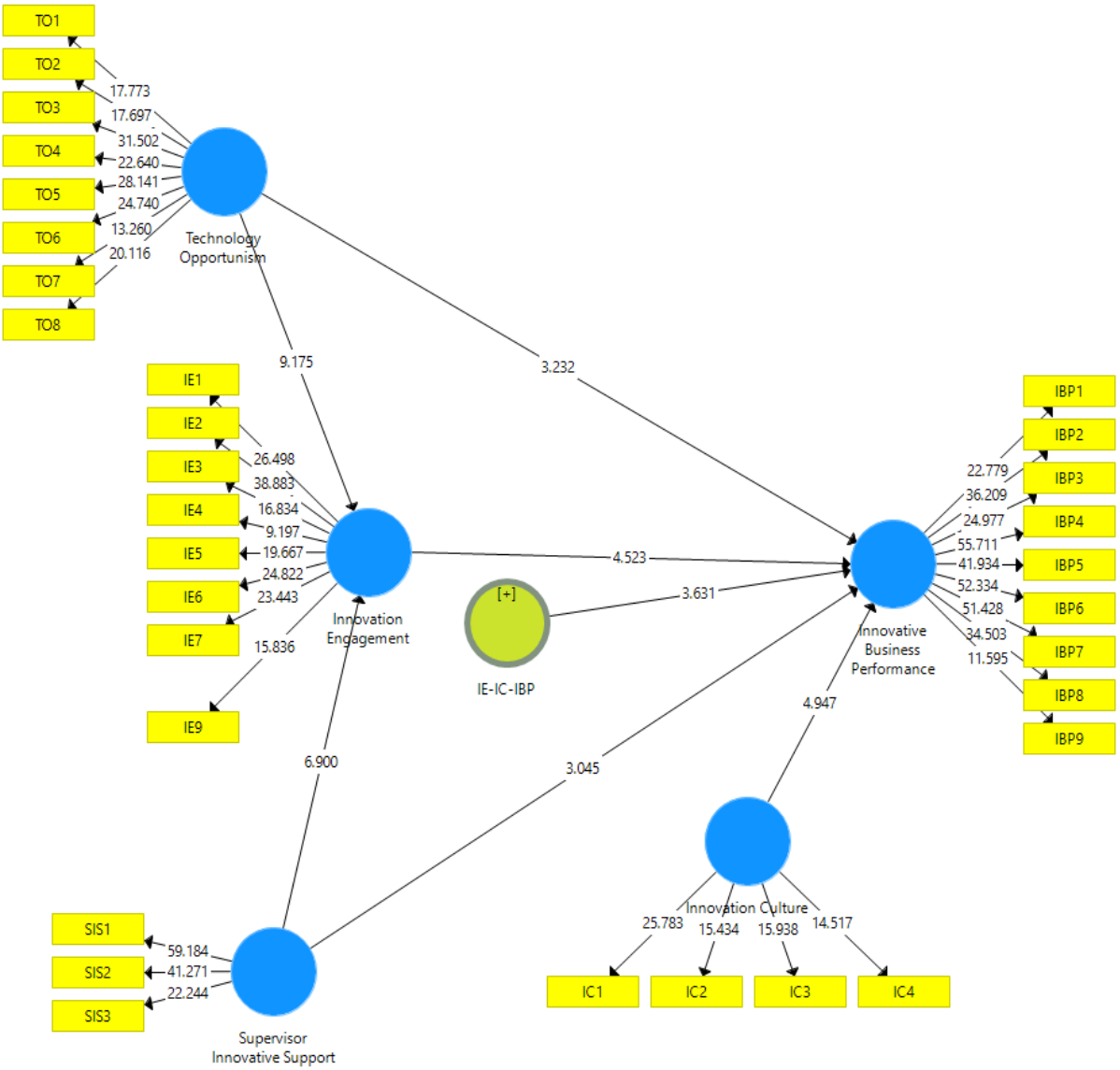

Fig.3: Structural Model

The results indicate that all proposed direct hypotheses were statistically significant and are therefore reported as supported. Detailed findings for the direct hypotheses are displayed in Figure 3 and Table 3.

Table 3
Structural Model

Relationship	β	STDEV	T Value	P value	Decision
IC-> IBP	0.263	0.053	4.947	0.000	Accepted
IE -> IBP	0.339	0.075	4.523	0.000	Accepted
SIS-> IE	0.370	0.054	6.900	0.000	Accepted
SIS -> IBP	0.171	0.056	3.045	0.002	Accepted
TO -> IE	0.511	0.056	9.175	0.000	Accepted
TO -> IBP	0.231	0.072	3.232	0.001	Accepted
TO->IE->IBP	0.174	0.049	3.543	0.000	Mediated
SIS->IE->IBP	0.126	0.030	4.232	0.000	Mediated
IE*IC->IBP	0.105	0.029	3.631	0.000	Moderated

4.5 Assessment of R2 (Square) and Q2 (Square)

In this study, the coefficient of determination (R^2) was used to quantify the variance explained in the endogenous constructs, while Q^2, following [24; 63], assessed the model's predictive relevance.

Table 4
Variance in Endogenous Variable R-Square

Endogenous Variables	R-Square	Adjusted R Square
Innovation Engagement	0.666	0.664
Innovative Business Performance	0.756	0.752

These indicators provide insight into the model's forecasting capability [31]. Q^2 was computed using the blindfolding procedure in Smart PLS, with values above zero indicating that exogenous constructs meaningfully predict endogenous variables [27]. Results, presented in Tables 4 and 5, confirm that the model exhibits satisfactory explained variance and predictive relevance.

Table 5
Predictive Relevance

Endogenous Variable	SSO	SSE	Q2 =(1-SSE/SSO)
Innovation Engagement	2240.000	1471.778	0.343
Innovative Business Performance	2520.000	1339.351	0.469

4.6 Effect Size Assessment

The impact of the independent variables was further evaluated through the assessment of effect size (f^2). Effect sizes of 0.02, 0.15, and 0.35 are conventionally interpreted as small, medium, and large effects, respectively. The results of the effect size analysis for the current study are summarised in Table 6.

Table 6
Effect Size

Independent Variable	IE	Effect Level	IBP	Effect Level
Innovation Culture			0.202	Medium
Innovation Engagement			0.149	Near to Medium
Supervisor Innovative Support	0.205	Medium	0.149	Weak
Technology Opportunism	0.391	Strong	0.078	Weak

5. Discussion

The findings of this study underlines the pivotal roles of innovation culture, innovation

engagement, supervisor innovative support, and technological opportunism in enhancing innovative business performance. The analysis of H1 revealed a positive and statistically significant association between innovation culture and innovative business performance ($\beta = 0.263$, $t = 4.947$, $p < 0.001$), corroborating prior research [14; 51; 64], highlighting the crucial contribution of a supportive innovation culture to organisational outcomes. Similarly, H2 indicated a significant relationship between innovation engagement and innovative business performance ($\beta = 0.339$, $t = 4.523$, $p < 0.001$), thereby addressing an empirical gap and supporting the assertions of [67].

Supervisor innovative support demonstrated a significant positive effect on both innovation engagement ($\beta = 0.370$, $t = 6.900$, $p < 0.001$) and innovative business performance ($\beta = 0.171$, $t = 3.045$, $p = 0.002$), as shown in H3 and H4. These results underscore the instrumental role of supervisors in fostering employee engagement and enhancing organizational innovation outcomes, while simultaneously reinforcing previous findings on the broader impact of supervisor support [2; 56; 73]. Technological opportunism emerged as a strong determinant in promoting both innovation engagement (H5: $\beta = 0.511$, $t = 9.175$, $p < 0.001$) and innovative business performance (H6: $\beta = 0.231$, $t = 3.232$, $p = 0.001$).

Innovation engagement significantly mediates the effects of technological opportunism and supervisor innovative support on innovative business performance (H6 and H7).This highlights innovation engagement as a key intervening mechanism that transforms organizational and supervisory inputs into enhanced innovation outcomes, corroborating previous research on the mediating potential of engagement [38; 74]. Specifically, proactive technological adoption and supervisory facilitation, recognition, and support stimulate innovation engagement, which in turn strengthens business innovative performance. In essence, innovation engagement functions as a latent driver that underpins the development and prediction of innovative business outcomes. Finally, the moderating effect of innovation culture was supported in H9, indicating that the relationship between innovation engagement and innovative business performance is contingent upon the level of innovation culture within the organization ($\beta = 0.105$, $t = 3.631$, $p < 0.001$). This finding reinforces the strategic importance of cultivating a culture that promotes innovation to maximize the impact of employee engagement on organizational innovation outcomes.

6. Theoretical Implications

Drawing upon the principles of the RBV Barney [13], this study has addressed notable gaps in understanding how technological opportunism and supervisor innovative support contribute to enhancing innovation engagement, which in turn serves as a mediating mechanism for predicting innovative business performance. The study also addresses a research gap by investigating how innovation culture moderates and strengthens the link between innovation engagement and innovative business performance.

7. Practical Implications

From a practical perspective, the findings underscore the importance for organizations to adopt an integrated approach that combines leadership, culture, employee engagement, and technological systems to optimize innovative business performance. The study highlights that organizations must remain vigilant regarding technological developments within their sector, as timely recognition and adoption of these advancements can significantly enhance innovation outcomes. Implementing and maintaining advanced information systems that support innovation processes is critical, and organizations are encouraged to establish dedicated teams or units responsible for this function. Furthermore, initiatives that facilitate knowledge sharing and technology updates can enable firms to capitalize efficiently on emerging technological opportunities. Supervisor support is also identified

as a crucial factor, not only in routine work activities but specifically in fostering employees' innovative efforts. To achieve this, organizations require managers and supervisory staff who are technologically competent. For small and medium-sized enterprises (SMEs) that may face challenges in recruiting such personnel, investment in targeted training programmes is recommended. These programmes can enhance the capacity of both managerial staff and SME owners to support innovation effectively. Additionally, the findings suggest that SMEs should actively cultivate innovation engagement among employees to strengthen business innovative performance. SME owners may consider collaborating with managers and supervisors to develop strategies that foster greater employee involvement in innovation and innovative practices within the workplace.

8. Limitations and Future Recommendations

Firstly, the research was restricted to the manufacturing sector, which may constrain the generalisability of the findings to other contexts. Future studies are therefore encouraged to investigate similar relationships across diverse occupational sectors, particularly those with a strong focus on innovation and technological adoption. Secondly, employing a longitudinal research design is recommended to capture the dynamic nature of the variables and to better establish causal relationships over time. Moreover, the study did not incorporate contextual variables that may influence the prediction of innovative business performance, such as competitive pressure, regulatory environment, or organizational structure. Future investigations aiming to extend the proposed model are encouraged to include such factors. Finally, subsequent research could explore how other organizational characteristics or mechanisms might moderate or mediate the relationships examined in this study, thereby offering deeper insights into the determinants of innovative business performance.

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