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The Moderating Role of Frugal Innovation in Enhancing the Impact of Innovation Orientation on Innovation Performance: Evidence from SMEs in Dongguan, China

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Abstract. In the context of global challenges and regional disparities, small and medium-sized enterprises (SMEs) in Dongguan and the Greater Bay Area, China, face heightened demands for innovation. This study investigates the relationship between innovation orientation and innovation performance, with a focus on the moderating effect of frugal innovation. Using structural equation modeling on data from 743 SMEs, the study reveals a significant positive impact of innovation orientation on innovation performance, further strengthened by frugal innovation's moderating role. These findings underscore SMEs' need to adopt frugal innovation strategies in resource-constrained settings, offering new insights for achieving innovation success in Dongguan and the Greater Bay Area.

Keywords: Innovation Orientation, Innovation Performance, Frugal Innovation, SMEs, Dongguan, Greater Bay Area

1. Introduction

In the context of deepening globalization and regional integration, Small and Medium-sized Enterprises (SMEs) in Dongguan, within China's Guangdong-Hong Kong-Macao Greater Bay Area (GBA), play a pivotal role in driving economic growth and technological innovation. However, these enterprises are currently confronted with unprecedented challenges in the global economic environment, including supply chain uncertainties, rapidly shifting market demands, and limited resources (United Nations, 2023). Against this backdrop, innovation activities have emerged as a critical determinant for SMEs' survival, competitiveness, and sustainable development (Lodh et al., 2014). The correlation between innovation orientation and innovation performance has garnered academic interest, with innovation orientation—defined as firms' proactive engagement in developing new products, processes, and market opportunities—seen as vital for the long-term success of SMEs (Lodh et al., 2014).

2. Literature Review and Hypothesis

2.1. Innovation Orientation and Innovation Performance

When examining the interplay between innovation orientation and the innovation performance of small and medium-sized enterprises (SMEs), it becomes apparent that the cornerstone of SMEs' performance enhancement is rooted in their capacity for innovation. Through diverse innovation avenues, SMEs have demonstrated their adeptness at bolstering their performance across various domains, including product development, service provision, management practices, and market expansion (Ali et al., 2020). Moreover, a pronounced linkage is observed between SMEs' international orientation and their performance on the global stage. While the nexus between innovation and performance has been well-acknowledged, the nuanced impact of technological innovation on global market performance necessitates deeper investigation (Baheri et al., 2019). The dynamics among strategic alignment, market management, and innovation performance further underscore the moderating influence of market management within this relationship (Adams et al., 2019). Additionally, emerging evidence suggests that internationalization significantly contributes to innovation performance in burgeoning markets (Genc et al., 2019).

Subsequent inquiries have highlighted the profound effect of relationship orientation on both partner commitment and corporate performance, notably in innovation, operational efficiency, and financial outcomes (Liao & Zhang, 2020; Ardito et al., 2021). Both digital and environmental orientations are found to exert a direct and synergistic positive influence on the innovation performance of products and processes, charting a pragmatic course for SMEs aiming to elevate their performance (Ardito et al., 2021). The association between green entrepreneurial orientation and green innovation plays a significant role in enhancing the operational efficiency of SMEs, an aspect scantily explored in prior research (Muangmee et al., 2021). Collectively, these studies lend credence to the proposition that innovation orientation positively correlates with the innovation performance of SMEs (Pscheidt-Gieseler et al., 2018). This leads to our first hypothesis:

H1: Innovation orientation significantly enhances the innovation performance of small and medium-sized enterprises (SMEs).

In the context of SMEs' innovation capabilities and resource scarcity, it is noted that SMEs frequently grapple with the hurdle of limited resources, which could impede their innovation potential (Woschke et al., 2017). Despite these constraints, SMEs exhibit a resilient innovation ethos. Faced with resource shortages, SMEs employ ingenious resource management strategies to lessen the impact of such limitations on their innovation endeavors (Collinson & Shaw, 2001; Borch & Madsen, 2007). As their resource pool expands, SMEs increasingly leverage frugal innovation for new growth opportunities (Kammerlander et al., 2015). Frugal innovation, or the knack for fostering value through inventive activities under resource-limited conditions, emerges as a pivotal strategy for SMEs amidst challenges (Lim Fujimoto, 2019). Drawing from a case study in Shandong Province, China, a three-dimensional frugal innovation framework is introduced, offering fresh perspectives for studying frugal

innovation (Lu et al., 2020). Within the SME sector, a conceptual framework identifying drivers of frugal innovation is proposed, marking a novel direction for future inquiries into frugal innovation (Niroumand et al., 2020). The criticality of sustainable leadership practices in driving frugal innovation gains prominence, especially in larger markets and in periods of technological upheaval (Iqbal et al., 2021). As resources become more abundant, SMEs shift their innovation focus from strictly frugal approaches to a broader exploration of innovation opportunities (Kammerlander et al., 2015). From this discussion, we formulate our second hypothesis:

H2: Frugal innovation plays a crucial moderating role in the relationship between innovation orientation and innovation performance in small and medium-sized enterprises (SMEs).

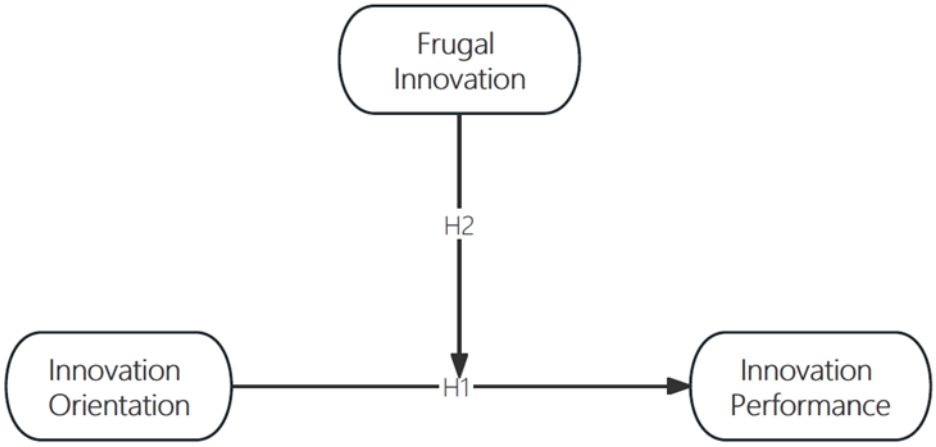

Fig. 1: Presents the Theoretical Framework for the Study

3. Research Methodology

3.1. Sample and Data Collection

To explore the relationship between innovation orientation and innovation performance and to examine the moderating role of frugal innovation, this study used structural equation modeling (SEM) to analyze survey data from 743 small and medium-sized enterprises (SMEs) in Dongguan. This study adheres to the United Nations classification of small and medium-sized enterprises (SMEs); micro-enterprises are defined as those with fewer than ten employees, small enterprises with fewer than 50 employees, and medium enterprises with fewer than 250 employees. The focus is on SMEs in the manufacturing sector, selected based on a minimum operational history of five years, with a majority having 11 to 15 years of experience.

In selecting the sample, the following criteria were applied:

Firm Size: Enterprises were categorized based on the number of employees into micro-enterprises (fewer than 10 employees), small enterprises (11 to 50 employees), and medium enterprises (51 to 250 employees).

Operational History: Firms with at least five years of operational history were chosen to ensure they had sufficient time to develop and implement innovation strategies.

Ownership Type and Managerial Characteristics: Recognizing that ownership structure and

managerial characteristics could influence innovation performance, these variables were controlled for in our sample selection.

To enhance precision, the study controls for variables such as the founding year and characteristics of the business owner/manager, recognizing their potential impact on innovation performance. Concurrently, Boso et al. (2013) highlighted the significant influence of company size on innovation activities. The association between a company's founding year and innovation exhibits inconsistency across studies, with some establishing a positive correlation and others revealing a negative one. Nonetheless, Wu et al. (2016) emphasized the divergence in research and development activities between young and established companies, resulting in distinctive innovation performances. Makate et al. (2019) Underscored the critical role of enterprise, owner characteristics, and policies as innovation correlates. Furthermore, entrepreneurial innovation was identified as a driver of firm performance.

Dongguan, a prominent manufacturing center in southern coastal China, is a paradigm of a "globalized" city region (Rolf, 2019). Lin et al. (2011) reported that by 2010, over 80% of Dongguan enterprises identified as exporters, contributing over 70% of revenue through exports. This context provides a unique research setting to explore how SMEs can enhance their performance through innovation orientation and frugal innovation strategies in the backdrop of globalization.

This study employed a novel approach by leveraging social media platforms for survey distribution, effectively navigating the challenges posed by the COVID-19 pandemic. Utilizing Questionnaire Star to deploy surveys through WeChat groups, we ensured a higher response rate and capitalized on the digital connectivity of SME owners and managers in Dongguan. This methodology allowed for a broad and diverse sample, reflecting a comprehensive view of the current SME landscape amidst unprecedented times. In scenarios of unknown population size presumed to be substantial, the Cochran Formula (Chaokromthong et al., 2021) (Ahmad & Halim, 2017) (Kotrlik & Higgins, 2001) Cochran stands as an appropriate tool for determining the requisite sample size.

$$n = \frac{p \times (1-p) \times (z)^2}{(e)^2} = \frac{0.1 \times (1-0.1) \times (2.58)^2}{(0.05)^2} = 240$$

n=samples size, p=the population proporation (p=0.1),
e=acceptable sampling error (e=0.05), z=z value at reliability level or
significance level. The reliability level is 99%, or the significant level is 0.01, z=2.58.

Many small and medium-sized enterprises have been closed because of the COVID-19. Posing a formidable challenge in accurately determining the surviving SME count in Dongguan. Adhering to Cocharan's research methodology, designed for scenarios with an unknown but presumed large population, a sample size of 240 has been deemed sufficient at a 99% confidence level with a 5% margin of error. This methodological rigor ensures the study's feasibility and enhances the generalizability of its findings. However, 743 valid questionnaires were collected through social media platforms, and the sample size was significantly higher than expected. This result may be due to the increased frequency of use of digital platforms during COVID-19, especially in the "globalized" urban areas represented by Dongguan, where entrepreneurs and managers have shown higher levels of engagement. The larger-than-expected sample size not only improves the generalizability of the research results but also enhances the statistical power of an in-depth understanding of the innovation performance of SMEs. Therefore, while the sample size exceeded expectations, this positively impacted the reliability and depth of the study.

Table 1. Firms and Respondent Background

Firm and Respondent Background	Frequency	Percentages
Firm Age	743	100.0
5-10 Years	447	60.2
11-15 Years	169	22.7
16-20 Years	82	11.0
Over 20 Years	45	6.1
Firm Size	743	100.0
1-9 Workers	151	20.3
10-49 Workers	417	56.1
50-250 Workers	175	23.6
Education Background	743	100.0
Bachelor's degree and below	349	47.0
Master's degree and above	394	53.0
Position	743	100.0
Frontline Management Personnel	199	26.8
Middle and Senior Management Personnel	544	73.2

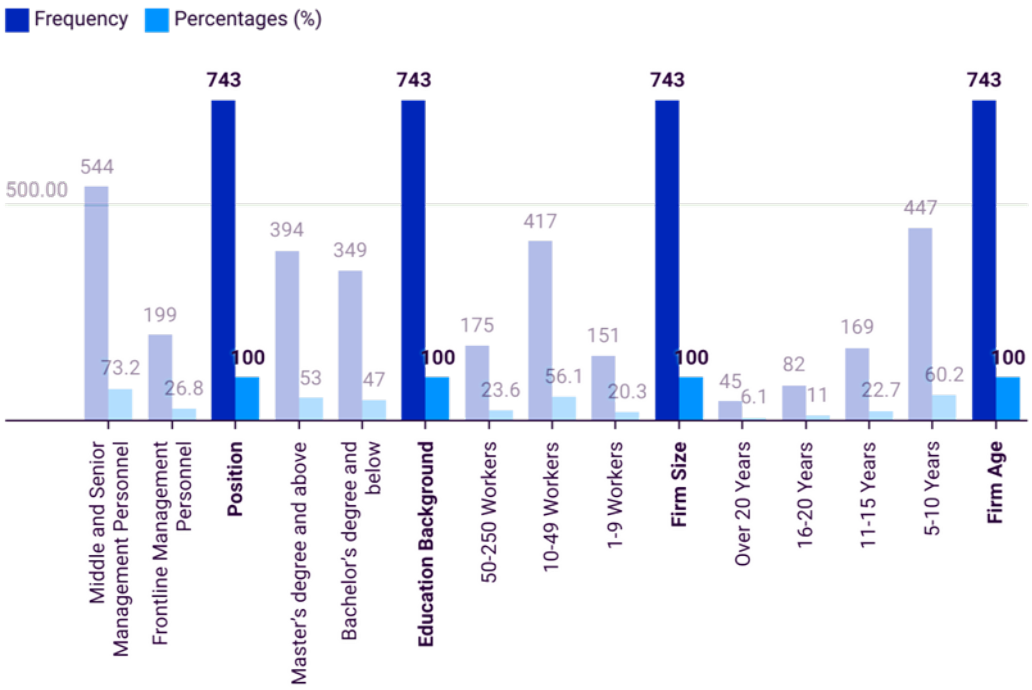

Fig. 2: Frequency of Firm Frequents Background

The selection of measurement variables is anchored in a comprehensive review of theoretical literature, ensuring each variable's relevance to the study's hypotheses. This approach aligns the measurement of innovation orientation, frugal innovation, and performance with established theoretical constructs, providing a robust framework for empirical analysis. Innovation orientation is measured through dimensions that reflect a firm's strategic commitment to innovation, while frugal innovation is assessed based on its emphasis on cost-effectiveness and resource efficiency. The theoretical basis for these measures stems from their recognized impact on SME performance, particularly in resource-constrained environments. This alignment with research hypotheses allows for a nuanced understanding of how these variables interact within the context of Dongguan's manufacturing sector, offering insights

into the broader applicability of these concepts in similar settings.

3.2. Survey Questionnaire and Measures

Structured questionnaires were used to collect data rather than create new instruments. The specific items for observing the variables are innovation orientation, frugal innovation, and innovation performance. An innovation orientation is a strategic capability that enables enterprises to understand and respond to customer needs, develop new products or services, and strengthen internal processes. The enterprise can attain and sustain leadership in its target market (Ergün & Kuşcu, 2013).

Warren et al. (2002). Suggests that innovation orientation is related to the modularization of products and the strategic intent of a company to generate and develop novel products and services. According to Amabile, innovation orientation focuses on creativity, proclivity for risk, and enthusiasm among company members for innovative endeavors (Amabile, 1997) (Manu & Sriram, 1996). Innovation orientation is the aggregate of strategically oriented creative projects within a company, guiding the introduction of new products/services and market entry. The primary dimensions of innovation orientation are creativity, adventurousness, future orientation, openness to change, and proactivity (Werlang & Rossetto, 2019) (Shoham et al., 2012). Five variables are associated with innovativeness: creativity, adventurousness, future orientation, openness to change, and risk-taking. Respondents rated their agreement on a scale from 1 to 5, with one being strongly disagree and 5 being strongly agree. Zainal (2022) gauged the dimensions of creativity, proactivity, and adventurousness through three variables. The measurement items for the five innovation orientation dimensions have been adapted.

In this study, innovation is defined as the "adoption of new elements, either internally or externally, representing a departure from established practices within the adopting organization." (Chaganti & Damanpour, 1991). Scholars widely agree on the manifold benefits of innovation, which encompass strengthening competitive advantage, expanding market share, improving operational efficiency, boosting profitability, enhancing overall organizational performance, and crafting adaptive strategies for intense competition and evolving consumer demands (Damanpour et al., 2009) (Hult et al., 2003). Previous scholarly investigations have examined various dimensions of innovation, encompassing product, process, and management innovations. For instance, Wang & Han (2011) evaluated innovation performance by considering technological and management innovation dimensions. Inkinen et al. (2015) have used a comprehensive approach to assessing innovation performance across product, process, management, marketing, and business model dimensions. Conversely, some studies focused exclusively on product innovation in evaluating innovation performance (Zeng et al., 2015) (L. Sanders Jones et al., 2014). This study adopts a focused approach, concentrating exclusively on product innovation. Product innovation is conceptualized as an ongoing, multifunctional process integrating internal and external organizational capabilities. It involves introducing new products or making significant enhancements to existing offerings. Zeng et al., 2015) (L. Sanders Jones et al., 2014). Innovation performance measurement involves four distinct variables drawn from (Abdallah et al., 2019) research. However, one variable was omitted due to identified lower factor loadings, leaving the remaining three variables predominantly capturing aspects of innovation speed and the innovativeness of new products (Dogbe et al., 2020).

"Jugaad innovation" or "Innovation under Constraint" is a distinctive approach characterized by achieving more with less. It emphasizes cost reduction and simplicity. Low environmental impact, user-friendly designs, and substantial cost reduction often define it. Scholarly works aim to provide theoretical and practical perspectives, establishing frameworks that distinguish them from concepts such as low-cost innovation, "good enough" innovation, frugal engineering, constraint-based innovation, or reverse innovation (Bhatti & Ventresca, 2013) (Brem & Wolfram, 2014) (Ostraszewska, Tylec, et al., 2015) (Zeschky et al., 2014). In this study, we adopt frugal innovation. Frugal Innovation (FI) is defined by four crucial and non-substitutable dimensions using formative indicators: "reduction in consumption cost, emphasis on core functionality, commitment to 'good enough' quality, and

sustainability." (Von Janda et al., 2020) (Weyrauch & Herstatt, 2017)). This study includes organizational trait variables—company age, size (measured by employee count), educational background of the management team, and managerial roles. These traits are recognized as influential factors in innovation performance and are consistent with prior findings. Boso et al. (2013) noted that the company's size influences innovation activities. Positive and negative relationships exist between company age and innovation performance. Nevertheless, Wu et al. (2016) underscore that research and development activities diverge between young and established companies, leading to distinctive innovation performances. The company's size moderates the relationship between innovation orientation and business performance (Farooq et al., 2021).

The measurement scales for key variables were chosen and adjusted based on an extensive literature review and existing research. Particular attention was given to indicators that accurately reflect the innovative activities of SMEs in resource-constrained environments. All measurement scales underwent translation and back-translation to ensure accuracy and cultural adaptability across languages.

The questionnaire was trialed on a small scale in the pretest phase to assess comprehensibility and applicability. The pretest involved a subset of the target sample, and their feedback was used to refine the questionnaire. The pretest results were also used to verify the scales' internal consistency and construct validity.

Reliability and validity tests included calculating Composite Reliability (CR) and Average Variance Extracted (AVE) and evaluating standard factor loadings. All scales had CR values above 0.7, AVE values above 0.5, and standard factor loadings above 0.5, indicating good reliability and convergent validity. Additionally, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were employed to validate the construct validity of the scales further.

Through these comprehensive measures, we ensured the accuracy and applicability of the measurement scales used in the study, providing a solid foundation for data analysis and interpretation. These steps enhance the credibility of the study results and offer transparency and rigor for subsequent research.

Table 2. Confirmatory Factor Analysis

Observed and Latent Variables	**Std. Factor Loading**
Innovation Orientation (IO) *Source(s): Based on (Zainal, 2022) (Werlang & Rossetto, 2019), (Shoham et al., 2012)*	
Creativity (CR). CA=0.809, CR=0.834, AVE=0.611	
CR1. Creativity is encouraged at the firm.	0.876
CR2. The firm's managers expect people to be useful in problem-solving.	0.601
CR2. The firm's managers expect people to be useful in problem-solving.	0.767
CR4. There are established practices at the firm for developing creativity.	0.672
Risk-taking (RT). CA=0.750, CR=0.758, AVE=0.466	
RT1. The firm likes to take high-risk options.	0.389 *
RT2. The firm adopts a vision that is not conservative in decision-making.	0.829
RT3. The firm takes a strong and aggressive position in decision-making to maximize the likelihood of exploiting potential opportunities.	0.781
RT4. The firm takes large-scale actions to achieve the objectives of the organization.	0.636
Future Orientation (FO). CA=0.889, CR=0.903, AVE=0.645	
FO1. The firm transmits a clear sense of future direction to employees.	0.847
FO2. The firm has a realistic future vision for all departments and employees.	0.849
FO3. The firm recognizes future opportunities.	0.880
FO4. The firm monitors the market.	0.654

Observed and Latent Variables	Std. Factor Loading
FO5. The firm identifies customers' future needs.	0.725
Openness to Change (OC). CA=0.928, CR=0.933, AVE=0.658	
OC1. The firm is always seeking to develop new answers.	0.722
OC2. The firm is quick to assist in the development of new ideas.	0.877
OC3. The firm is open and receptive to new ideas.	0.754
OC4. The people at the firm are always seeking new and recent ways of dealing with problems.	0.855
OC5. The firm seeks suggestions for changes to working routines.	0.787
OC6. The firm is receptive to changes to working routines.	0.807
OC7. The firm puts new knowledge learned in training and education into practice.	0.861
Proactiveness (PR). CA=0.904, CR=0.900, AVE=0.611	
PR1. We take the initiative to mold the environment to take advantage.	0.810
PR2. We are always the first to launch new services.	0.791
PR3. We normally take the initiative to introduce new administrative techniques.	0.843
PR4. The firm anticipates the competition.	0.806
PR5. The firm anticipates problems.	0.772
PR6. The firm has the people, resources, and equipment needed to develop new services.	0.683
Innovation Performance (IP): CA=0.906, CR=0.910, AVE=0.774	
Source: Based on (Abdallah et al., 2019) and (Dogbe et al., 2020).	
IP1: We can develop new products/services with speed.	0.832
IP2: We can launch new products/services on time.	0.897
IP3: Our new products/services are innovative.	0.897
Frugal Innovation (FI): CA=0.847, CR=0.867, AVE=0.609 *Source: Based on (Weyrauch & Herstatt, 2017), (Von Janda et al., 2020)*	
FI1: The new products we have developed emphasize reducing consumer costs.	0.716
FI2： The new products we have developed focus on essential functionality.	0.851
FI3： The new products we have developed emphasize good enough quality.	0.887
FI4： The new products we have developed are sustainable.	0.642
Note(s): * Item deleted due to poor factor loading.	

3.3. Model Specification and Evaluation

Structural equation modeling (SEM) was selected to address this study's latent variables and test the moderating effect of frugal innovation. To ensure the accuracy and reliability of the model, we have taken the following steps:

Evaluation of model fitting criteria: We used a variety of criteria to assess the goodness-of-fit of the model, including the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). These criteria help us assess how well the model matches the observations. We set industry-standard cut-off points, such as CFI and TLI greater than 0.90 and RMSEA less than 0.08, as indicators of good fit of the model.

Handling of Common Approach Deviations: We have taken several measures to reduce the potential impact of standard approach deviations. First, we ensured the clarity and unambiguity of the items in the questionnaire design to minimize response bias. Second, we use anonymity in the data

collection to reduce societal expectation bias. Finally, we used Harman's single-factor test during the data analysis phase to check for common method bias. If the fit of a single-factor model is much lower than ours, this would indicate that common method bias is not an issue.

Validation of latent variables: We validated the construct validity of latent variables by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The results of the CFA provide detailed information about the relationship between latent and observed variables, ensuring the reliability of the model.

Through these detailed specifications and evaluation steps, we ensure the rigor of the SEM analysis and the confidence of the results. These measures help increase research transparency and provide readers with a basis for assessing the quality of research. The choice of structural equation modeling (SEM) as our quantitative method was driven by its robustness in handling complex relationships between multiple variables and constructs, offering deep insights into the moderating effects of frugal innovation on the innovation orientation-performance link. SEM's ability to simultaneously test various hypotheses and model latent constructs with observed variables makes it particularly suitable for assessing the nuanced interactions within our theoretical framework. This approach not only enhances the precision of our findings but also contributes to the methodological rigor of research in the field of innovation studies.

3.4. Relationships between Firm Background and Innovation Performance

Unlike conventional methods, this study utilizes Bayesian modeling, offering distinct advantages in handling small sample sizes, incorporating domain expertise, and directly estimating parameter uncertainties. This analytical framework provides accurate and reliable results, deepening our understanding of the influence of individual traits on innovation performance. At its core, the Bayesian Model employs a fundamental formula:

$$P(\theta|y,X) \propto P(y|X,\theta) \cdot P(\theta)$$

Where θ represents model parameters, y denotes innovation performance, and X X encompasses explanatory variables. Through this formula, we can integrate prior information and observed data, infer the posterior distribution of model parameters, and thereby gain a more comprehensive understanding of how individual traits potentially influence innovation performance.

To assess the regression model's statistical significance, we used variance analysis. Table 3-3 summarizes the results. The dependent variable, 'Innovation Performance,' is one of several independent variables in the model.

Table 3. ANOVA[a,b,c]

Source	Sum of Squares	df	Mean Square	F	Sig
Regression	343638.383	8	42954.798	128.024	.000
Residual	246273.153	734	335.522		
Total	589911.536	742			

a. Dependent Variable: Innovation Performance.

b. model: (Intercept), Position, Education Background, Firm Size, Firm Age, Frugal Innovation.

c. Regression Weight Variable: Innovation Orientation.

The model's ability to understand a substantial portion of the variance in the dependent variable is underscored by the ANOVA Table 3-3. Detailed breakdowns of regression components, including sums of squares and degrees of freedom, give nuanced insights into the model's performance.

Table 4. Bayes Factor Model Summary[b,c]

Bayes Factors	R	R Square	Adjusted R Square	Std. Error of the Estimate
3.810E+129	.763	.583	.578	18.3173

a. Method: JZS

b. model: (Intercept), Position, Education Background, Firm Size, Firm Age, Frugal Innovation

c. Regression Weight Variable: Innovation Orientation

d. Bayes factor: Testing model versus null Model (Intercept).

There is evidence for independent variables in the regression model. The extremely high Bayesian factor supports independent variables. The model explains 58.3% of the variance in 'innovation performance.' The explanatory power is enhanced by introducing the interaction variable 'innovation orientation.' The JZS method provides robust support for model comparison.

Table 5. Innovation Factors: Bayesian Analysis Overview

Variable	Posterior Mode	Posterior Mean	95% Credible Interval (Lower Bound, Upper Bound)
Intercept	-0.849	-0.849	(-1.861, 0.162)
Position (Frontline Management)	-0.592	-0.592	(-0.926, -0.258)
Position (Middle and Senior Management)	–	–	–
Education Background (Bachelor's degree and below)	-0.713	-0.713	(-1.002, -0.424)
Education Background (Master's degree and above)	–	–	–
Firm Size (1-9 Workers)	-0.573	-0.573	(-1.044, -0.102)
Firm Size (10-49 Workers)	-0.253	-0.253	(-0.628, 0.121)
Firm Size (50-250 Workers)	–	–	–
Firm Age (5-10 Years)	2.267	2.267	(1.620, 2.915)
Firm Age (11-15 Years)	1.219	1.219	(0.553, 1.884)
Firm Age (16-20 Years)	1.719	1.719	(1.001, 2.437)
Firm Age (Over 20 Years)	–	–	–

Variable	Posterior Mode	Posterior Mean	95% Credible Interval (Lower Bound, Upper Bound)
Frugal Innovation	0.723	0.723	(0.675, 0.771)

Table 3-5 outlines critical determinants of innovation performance via Bayesian analysis. The intercept's posterior mode of -0.849 suggests an overall negative impact, with a 95% credible interval of (-1.861, 0.162).

There is a negative impact on frontline managers and individuals with a bachelor's degree or below. Managers with a master's degree or higher have a small impact. Company size indicates a more pronounced negative effect for smaller companies (1-9 employees), diminishing with increasing size. Regarding company age, relatively young companies (5-10 years) expect higher innovation performance.

Embracing frugal innovation is effective, with a posterior mode of 0.723 and a positive 95% credible interval.

Considering the Bayesian nature and associated uncertainties, these insights inform targeted innovation strategies.

3.5. Relationships between Key Variables and Innovation Performance

The relationship between individual traits and innovation performance was explored in a Bayesian analysis. The aim was to show potential connections between innovation performance and attributes such as creativity, risk-taking propensity, future orientation, openness to change, proactiveness, innovation orientation, and frugal innovation.

Our analysis unfolded using the following model and formula:

Model 1: Relationship Between Individual Traits and Innovation Performance

$$
\begin{aligned}
&Innovation\ Performance \\
&\quad = \beta_0 + \beta_{Creativity} \times Creativity\ + \beta_{Risk\ Taking} \times Risk\ Taking \\
&\quad + \beta_{Future\ Orientation} \times Future\ Orientation + \beta_{Openness\ to\ Change} \times Openness\ to\ Change \\
&\quad + \beta_{Proactiveness} \times Proactiveness + \beta_{Innovation\ Orientation} \times Innovation\ Orientation \\
&\quad + \beta_{Frugal\ Innovation} \times Frugal\ Innovation + \epsilon
\end{aligned}
$$

This model reveals the direct impact of individual traits on innovation performance, where Beta represents the regression coefficients and epsilon represents the error term.

Model 2: Introducing Frugal Innovation as a Moderating Variable

$$
\begin{aligned}
&Innovation\ Performance \\
&\quad = \beta_0 + +\beta_{Innovation\ Orientation} \times Innovation\ Orientation \\
&\quad + \beta_{Frugal\ Innovation} \times Frugal\ Innovation \\
&\quad + \beta_{Innovation\ Orientation\ \times\ Frugal\ Innovation} \times (Innovation\ Orientation \\
&\quad \times Frugal\ Innovation) + \epsilon
\end{aligned}
$$

Expanding Model 1, Model 2 introduces frugal innovation as a moderating variable to explore its impact on innovation performance and synergies with innovation orientation. Employing Bayesian analysis and the Bayes Factor enhances research reliability, providing deep and credible quantitative insights into organizational behavior and emphasizing the influence of individual traits on innovation performance.

Table 6. Innovation Performance Summary with Key Variables

Variable	Pearson Correlation	Bayes Factor
Creativity	0.327	0.000
Risk Taking	0.716	0.000
Future Orientation	0.284	0.000
Openness to Change	0.086	2.246
Proactiveness	0.289	0.000
Innovation Orientation	0.784	0.000
Frugal Innovation	0.715	0.000

The analysis revealed significant correlations between individual traits and innovation performance. Creativity demonstrated a strong positive association with outstanding innovation performance ($r=0.327$, $p<0.05$), indicating that individuals who foster innovative ideas and solutions are more likely to achieve innovation success. Similarly, risk-taking exhibited a substantial positive correlation ($r=0.716$, $p<0.05$), suggesting that those who embrace more significant risks are more likely to succeed in innovation. As indicated by future orientation, a forward-looking perspective also showed a significant positive correlation ($r=0.284$, $p<0.05$), underscoring the positive impact of anticipating future trends and opportunities on innovation performance.

Proactiveness ($r=0.289$, $p<0.05$) indicated a positive association, suggesting that individuals with a heightened sense of proactiveness are closely linked to enhanced innovation performance. Innovation Orientation had the most significant positive impact ($r=0.784$, $p<0.05$), highlighting that a focus on innovation orientation correlates with remarkable success in innovation. Openness to change, though modest (Bayesian Factor=2.246), also showed a positive correlation, indicating that individuals open to change are more adaptable to new innovative practices.

As a moderating variable, frugal innovation had a notable positive moderating effect on innovation performance ($r=0.715$). This finding emphasizes that frugal innovation strategies can amplify the impact of individual traits on innovation performance, especially in resource-constrained environments.

In summary, these findings underscore the positive associations between specific traits and innovation performance, offering valuable insights for organizations in crafting effective innovation strategies. Organizations can better design and implement innovation initiatives to foster success in competitive markets by understanding how these traits influence innovation performance. To enhance the portrayal of the relationship between innovation performance and other variables, we have constructed Figure 3.

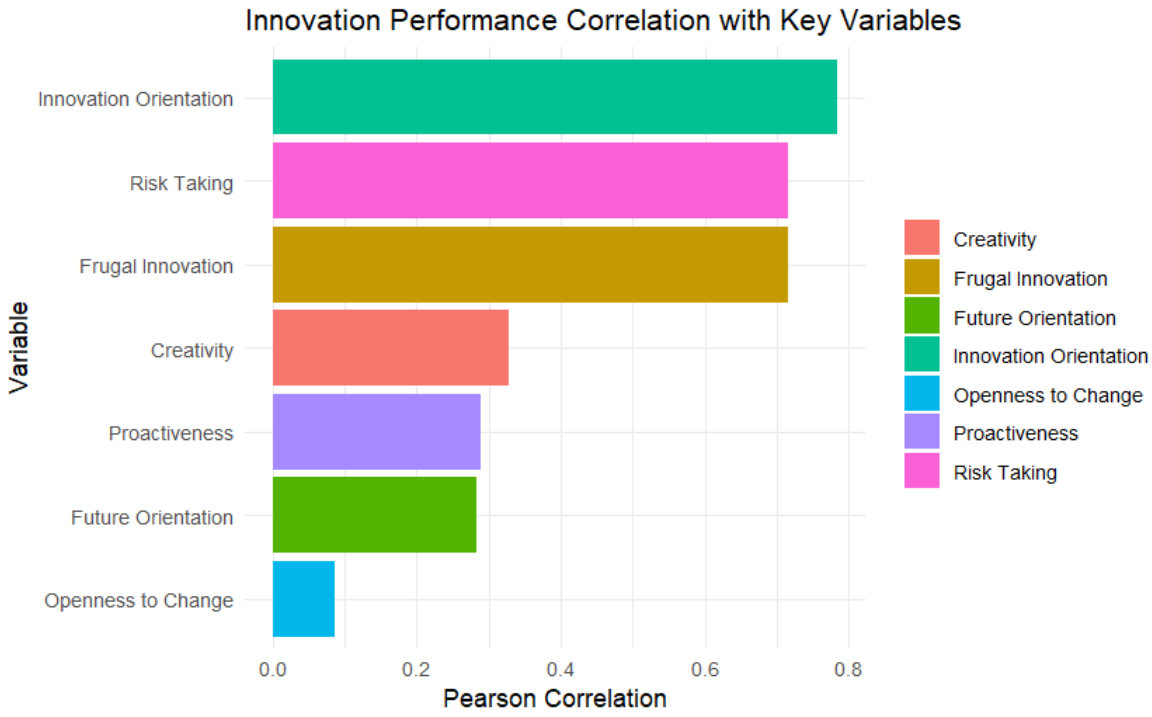

Fig. 3: Innovation Performance Correlation with Key Variables

3.6. Regression Analysis

We rigorously investigated the interplay between innovation orientation and frugal innovation, employing three linear regression models to assess their combined impact on innovation performance comprehensively. This methodological approach enhances our understanding of the intricate relationships between these factors, advancing insights into their collective influence on innovation outcomes.

Model 1 establishes the exclusive relationship between innovation performance and orientation, isolating the latter's impact as a baseline.

$$Innovation\ Performance = \beta_0 + \beta_{Innovation\ Orientation} \times Innovation\ Orientation + \epsilon$$

Model 2 builds on Model 1 by introducing frugal innovation as an additional independent variable, offering a comprehensive examination of its effects on innovation performance and elucidating its collaborative impact with innovation orientation.

$$\text{Innovation Performance} = \beta_0 \times \beta_{\text{Innovation Orientation}} \times \text{Innovation Orientation} + \beta_{\text{Frugal Innovation}} \times \text{Frugal Innovation} + \epsilon$$

The interaction terms innovation orientation, and frugal innovation are introduced in Model 3 to assess the effect on the relationship between innovation orientation and performance.

Innovation Performance

$$= \beta_0 + \beta_{\text{InnovationOrientation}} \times \text{Innovation Orientation} + \beta_{\text{FrugalInnovation}} \times \text{Frugal Innovation}$$

$$+ \beta_{\text{Interaction}} \times (\text{Innovation Orientation} \times \text{Frugal Innovation}) + \epsilon$$

We conducted linear regression analyses on the collected and valid data, yielding the following results:

Table 7. Regression Analysis Results:

Model	Variables	Coefficients	R Square	Sum of Squares	F Value	Sig
1	IP	0.784	0.615	4006.208	1181.876	0.000
2	IO	0.565	0.652	4258.662	697.426	0.000
	FI	0.294				
3	IO	0.191	0.661	4314.496	482.329	0.000
	FI	-0.088				
	IN	0.712				

Regression Analysis Overview:

Refer to Tables 3-7 for more information. There are significant outcomes with an R Square of 61.5%, an F-value of 1181.876, and a notable p-value of 0.000 in Model 1's regression analysis on innovation orientation and performance. The model shows that each unit increase in innovation orientation can achieve a 0.784 rise in innovation performance. The positive impact on innovation performance is demonstrated by innovation orientation. There is a visual representation in Fig 4.

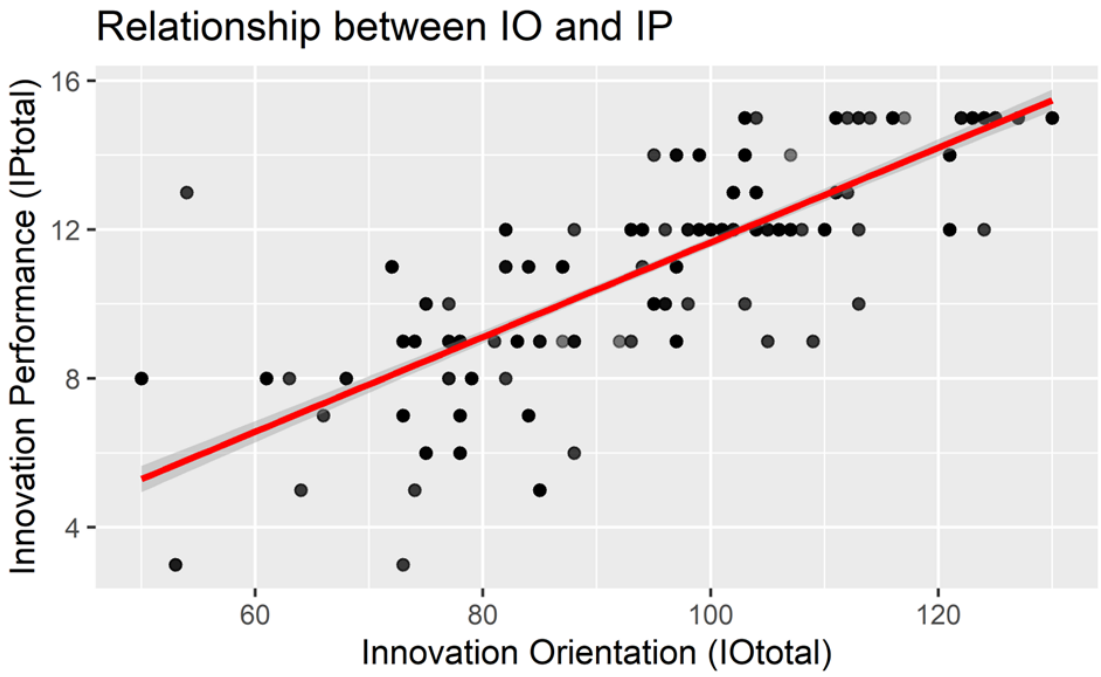

Fig.4: Model 1 Relationship between IO and IP

Statistical significance is maintained by model 2, including frugal innovation. Both innovation orientation and frugal innovation influence innovation performance. The model has an R Square of

65.2%, an F-value of 697.426, and a p-value of 0.000.

Improving upon Model 1, Model 2 reveals the positive contribution of frugal innovation to innovation performance, supporting Hypothesis 1. Figure 5, derived from Model 2, incorporates frugal innovation as a moderating variable and delineates a refined distribution of innovation performance, underscoring the nuanced impact of frugal innovation beyond the initial model's scope.

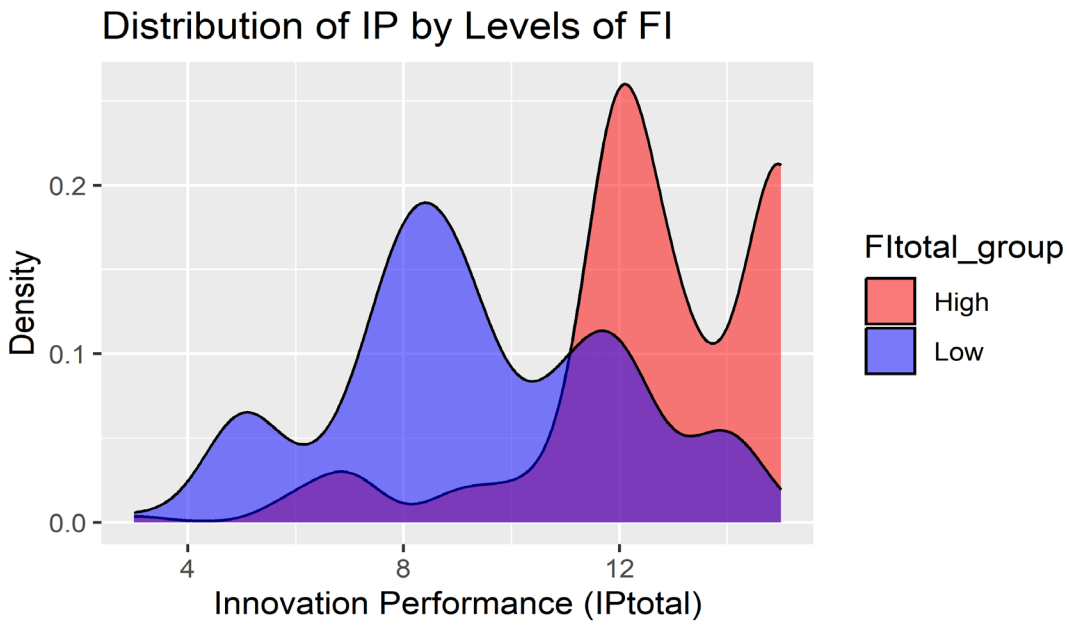

Fig.5: Model 2 Distribution of IP by Levels of FI.

Model 3, with an R Square of 66.1%, an F-value of 482.329, and a p-value less than 0.001, significantly extends our understanding by incorporating an interaction term between innovation orientation and frugal innovation, positively influencing innovation performance. As depicted in Figure 6, the interaction effect is visually represented by the divergence of the trend lines, indicating that the synergy between innovation orientation and high levels of frugal innovation results in a more pronounced increase in innovation performance.

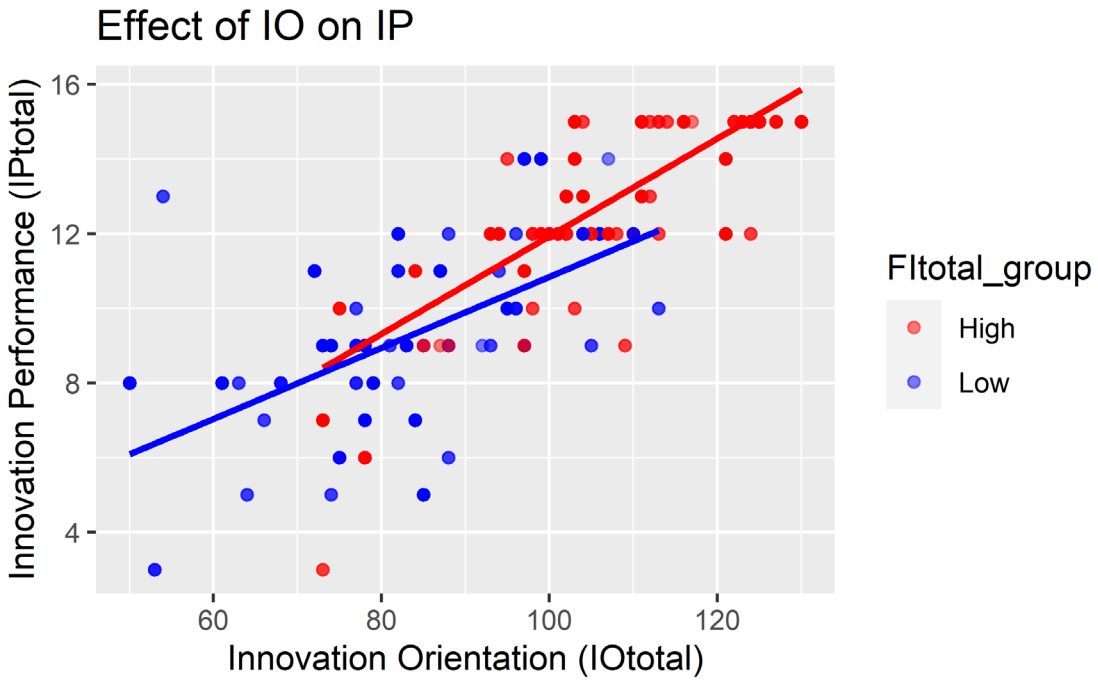

Fig.6: Model 3 Effect of IO on IP

The graphical illustrations complement the empirical insights from regression analysis, confirming the statistically significant influence of frugal innovation as evidenced by the interaction term in Model 3. The integration of visual and analytical methods offers a detailed examination of the complex dynamics of innovation within small and medium-sized enterprises. This study provides clear evidence of the positive impact of innovation orientation on performance, establishing a solid framework for further in-depth research into how innovation orientation and frugal innovation interact.

4. Result

4.1. Conclusion

This study delves into innovation dynamics within Dongguan's small and medium enterprises (SMEs). The linear regression model establishes a positive relationship between innovation orientation and performance.

Exploring our second hypothesis (H2), Model 2 reveals an independent positive impact of frugal Innovation (FI) on innovation performance (frugal Innovation coefficient=0.294, $p<0.001$). Model 3 introduces a significant positive moderating effect of the interaction variable (interaction coefficient = 0.712, $p<0.001$), emphasizing the constructive moderating role of frugal innovation between innovation orientation and innovation performance.

In essence, this study contributes empirical evidence supporting the pivotal role of innovation orientation. It highlights the nuanced moderating effect of frugal innovation within the innovation-performance dynamics of SMEs in Dongguan. These findings provide actionable insights for practitioners and policymakers aiming to enhance innovation capabilities and performance in the SME landscape.

Table 8. Research Conclusion

Hypothesis	Conclusion
H1. Innovation orientation positively influences innovation performance in small and medium enterprises.	Supported
H2. The relationship between innovation orientation and innovation performance in small and medium enterprises is moderate by frugal innovation.	Supported

Our study strongly validates the hypotheses. Innovation orientation significantly influences innovation performance, and introducing frugal innovation reinforces this relationship, serving as a crucial moderator. These findings enhance both theoretical understanding and practical insights.

This study offers valuable insights into how frugal innovation strategies can enhance innovation orientation's impact on SMEs' innovation performance in Dongguan and the Greater Bay Area. The results indicate that SMEs with a substantial innovation orientation can improve their innovation outcomes by integrating frugal innovation practices that focus on cost reduction, core functionality, and sustainability. By doing so, these businesses can effectively navigate the challenges of resource constraints and uneven regional development, which are prevalent in emerging economies.

The implications of this research are practical and significant for both SMEs and policymakers. The study emphasizes the criticality of developing and executing frugal innovation strategies for SMEs to surmount resource limitations and foster innovation-driven success. This includes concentrating on essential product features, utilizing external resources and networks, and adopting customer-centric and sustainable innovation practices. Policymakers are encouraged to implement supportive policies and programs that bolster the innovation capabilities of SMEs in the region. This could involve offering training and mentoring, improving access to funding and markets, and fostering collaboration and knowledge sharing among SMEs.

4.2. Discussion

4.2.1 Insightful Exploration of Determinants Impacting Innovation Performance

Our study investigates crucial factors affecting innovation performance in SMEs. The negative intercept underscores its overall adverse impact, including factors such as the negative correlation between frontline managers and individuals with a bachelor's degree or lower. Smaller companies, especially those with 1-9 employees, show more pronounced adverse effects. Additionally, relatively young companies (5-10 years) express higher expectations for innovation performance, shedding light on the influence of company age.

4.2.2 Effectiveness of Frugal Innovation and Its Moderating Role

In resource-constrained settings, frugal innovation provides practical guidance for innovation managers and positively moderates the relationship between innovation orientation and performance.

4.2.3 Multifaceted Analysis of Correlations and Influencing Factors

Positive correlations were found between creativity, risk-taking, future orientation, proactiveness, innovation orientation, and performance. While positively correlated, openness to change exhibits a relatively modest effect. The need for a multi-pronged approach to innovation performance is emphasized in this nuanced analysis.

4.2.4 Validation of Regression Models and Interaction Effects

The regression models validate the positive impact of innovation orientation on performance, reinforced by frugal innovation. The interaction effect highlights their synergistic influence, providing valuable theoretical and practical implications.

4.3. Further Study

This study Despite the study's contributions, it acknowledges certain limitations. The reliance on a single-informant approach may introduce bias, and the focus on a specific geographic context may limit the generalizability of the findings. Additionally, the cross-sectional nature of the data does not capture the dynamic evolution of the relationships between variables over time. To address these limitations, future research should consider employing multiple informants or objective data sources, conducting comparative studies across various regions or countries, and utilizing longitudinal or experimental designs to establish causal relationships.

1. Enhance model clarity by addressing multicollinearity through rigorous analysis.
2. Explore diverse industries to understand variations in innovation elements for a comprehensive view.
3. Investigate the impact of organizational culture on innovation dynamics.
4. Use longitudinal methods to study the evolving relationship between innovation elements and performance.
5. Translate research findings into practical business strategies for seamless integration into organizational development.

By further exploring these avenues, future research can provide a more comprehensive understanding of the dynamics of innovation within SMEs and inform the development of more effective frugal innovation strategies and policies.

Reference

Abdallah, A. B., Dahiyat, S. E., & Matsui, Y. (2019). Lean management and innovation performance. *Management Research Review*, *42*(2), 239–262. Retrieved from http://dx.doi.org/10.1108/MRR-10-2017-0363

Adams, P., Freitas, I. M. B., & Fontana, R. (2019). Strategic Orientation, innovation performance and the moderating influence of marketing management. *Journal of Business Research*, *97*, 129–140. Elsevier. https://doi.org/10.1016/j.jbusres.2018.12.071

Agarwal, N., & Brem, A. (2017). Frugal innovation-past, present, and future. *IEEE Engineering Management Review*, *45*(3), 37–41. IEEE. https://doi.org/10.1109/EMR.2017.2734320

Ahmad, H., & Halim, H. (2017). Determining sample size for research activities. *Selangor Business Review*, 20–34. https://sbr.journals.unisel.edu.my/ojs/index.php/sbr/article/view/12

Ali, H., Hao, Y., & Aijuan, C. (2020). Innovation capabilities and small and medium enterprises' performance: An exploratory study. *The Journal of Asian Finance, Economics and Business*, *7*(10), 959–968. Korea Distribution Science Association. https://doi.org/10.13106/jafeb.2020.vol7.no10.959

Amabile, T. M. (1997). Motivating organizational creativity: Doing what you love and loving what you do. *California Management Review*, *40*(1), 39–58. SAGE Publications Sage CA: Los Angeles, CA. https://doi.org/10.2307/41165921

Ardito, L., Raby, S., Albino, V., & Bertoldi, B. (2021). The duality of digital and environmental orientations in the context of SMEs: Implications for innovation performance. *Journal of Business Research*, *123*, 44–56. Elsevier. https://doi.org/10.1016/j.jbusres.2020.09.022

Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative Science Quarterly*, *50*(3), 329–366. Retrieved from https://doi.org/10.2189/asqu.2005.50.3.329

Bhatti, Y. A., & Ventresca, M. (2013). How can 'frugal innovation' be conceptualized? *Available at SSRN 2203552*. https://dx.doi.org/10.2139/ssrn.2203552

Borch, O. J., & Madsen, E. L. (2007). Dynamic capabilities facilitating innovative strategies in SMEs. *International Journal of Techno entrepreneurship*, *1*(1), 109–125. Inderscience Publishers. https://doi.org/10.1504/IJTE.2007.014731

Boso, N., Story, V. M., & Cadogan, J. W. (2013). Entrepreneurial orientation, market orientation, network ties, and performance: Study of entrepreneurial firms in a developing economy. *Journal of Business Venturing*, *28*(6), 708–727. Elsevier. https://doi.org/10.1016/j.jbusvent.2013.04.001

Brem, A., & Wolfram, P. (2014). Research and development from the bottom up, including introducing terminologies for new product development in emerging markets. *Journal of Innovation and Entrepreneurship*, *3*(1), 1–22. Springer Open. https://doi.org/10.1186/2192-5372-3-9

Chaganti, R., & Damanpour, F. (1991). Institutional ownership, capital structure, and firm performance. *Strategic Management Journal*, *12*(7), 479–491. Wiley Online Library. https://doi.org/10.1002/smj.4250120702

Chaokromthong, K., Sintao, N., et al. (2021). Sample size estimation using Yamane, Cochran, Krejcie, and Morgan, green formulas, and Cohen statistical power analysis by g power and comparisons. *Apheit International Journal*, *10*(2), 76–86. https://so04.tci-thaijo.org/index.php/ATI/article/view/254253

Collinson, E., & Shaw, E. (2001). Entrepreneurial marketing–a historical perspective on development and practice. *Management decision*, *39*(9), 761–766. MCB UP Ltd. https://doi.org/10.1108/EUM0000000006221

Damanpour, F., Walker, R. M., & Avellaneda, C. N. (2009). Combinative effects of innovation types and organizational performance: A longitudinal study of service organizations. *Journal of Management Studies*, *46*(4), 650–675. Wiley Online Library. https://doi.org/10.1111/j.1467-6486.2008.00814.x

Dogbe, C. S. K., Tian, H., Pomegbe, W. W. K., Sarsah, S. A., & Otoo, C. O. A. (2020). Effect of network embeddedness on innovation performance of small and medium-sized enterprises: The moderating role of innovation openness. *Journal of Strategy and Management*, *13*(2), 181–197. Emerald Publishing Limited. https://doi.org/10.1108/JSMA-07-2019-0126

Ergün, H. S., & Kuşcu, Z. K. (2013). Innovation orientation, market orientation, and e-loyalty: Evidence from Turkish e-commerce customers. *Procedia-Social and Behavioral Sciences*, *99*, 509–516. Elsevier. https://doi.org/10.1016/j.sbspro.2013.10.520

Farooq, R., Vij, S., & Kaur, J. (2021). Innovation orientation and its relationship with business performance: The moderating role of firm size. *Measuring Business Excellence*, *25*(3), 328–345. Emerald Publishing Limited. https://doi.org/10.1108/SCM-02-2021-0071

Genc, E., Dayan, M., & Genc, O. F. (2019). The impact of SME internationalization on Innovation: The mediating role of the market and entrepreneurial orientation. *Industrial Marketing Management*, *82*, 253–264. Elsevier. https://doi.org/10.1016/j.indmarman.2019.01.008

Hult, G. T. M., Snow, C. C., & Kandemir, D. (2003). The Role of Entrepreneurship in Building Cultural Competitiveness in Different Organizational Types. *Journal of Management*, 29(3), 401-426. https://doi.org/10.1016/S0149-2063_03_00017-5

Inkinen, H.T., Kianto, A. and Vanhala, M. (2015). "Knowledge management practices and innovation performance in Finland," *Baltic Journal of Management*, Vol. 10 No. 4, pp. 432-455. https://doi.org/10.1108/BJM-10-2014-0178

Iqbal, Q., Ahmad, N. H., & Halim, H. A. (2021). Insights on entrepreneurial bricolage and frugal innovation for sustainable performance. *Business Strategy & Development*, *4*(3), 237–245. Wiley Online Library. https://doi.org/10.1002/bsd2.147

Kammerlander, N., Burger, D., Fust, A., & Fueglistaller, U. (2015). Exploration and exploitation in established small and medium-sized enterprises: The effect of CEOs' regulatory focus. *Journal of Business Venturing*, *30*(4), 582–602. Elsevier. https://doi.org/10.1016/j.jbusvent.2014.09.004

Kotrlik, J., & Higgins, C. (2001). Organizational research: Determining the appropriate sample size in survey research appropriate sample size in survey research. *Information technology, learning, and performance journal*, *19*(1), 43. https://www.opalco.com/wp-content/uploads/2014/10/Reading-Sample-Size1.pdf

L. Sanders Jones, J., & Linderman, K. (2014). Process management, innovation, and efficiency performance: The moderating effect of competitive intensity. *Business Process Management Journal*, *20*(2), 335–358. Emerald Group Publishing Limited. https://doi.org/10.1108/BPMJ-03-2013-0026

Liao, Z., & Zhang, M. (2020). The influence of responsible leadership on environmental innovation and performance: The moderating role of managerial discretion. *Corporate Social Responsibility and Environmental Management*, *27*(5), 2016–2027. Wiley Online Library. https://doi.org/10.1002/csr.1942

Lin, G. C., Wang, C. C., Zhou, Y., Sun, Y., & Wei, Y. D. (2011). Placing technological innovation in globalizing China: Production linkage, knowledge exchange and innovative performance of the ICT industry in a developing economy. *Urban Studies*, *48*(14), 2999–3018. SAGE Publications Sage UK: London, England. https://doi.org/10.1177/0042098010396232

Lodh, S., Nandy, M., & Chen, J. (2014). Innovation and family ownership: Empirical evidence from i ndia. *Corporate governance: An international review*, *22*(1), 4–23. Wiley Online Library. https://doi.org/10.1111/corg.12034

Makate, C., Makate, M., Siziba, S., & Sadomba, Z. (2019). The impact of innovation on the performance of small-to-medium informal metal-trade enterprises in Zimbabwe. *Cogent Business & Management*, *6*(1), 1625095. Taylor & Francis. https://doi.org/10.1080/23311975.2019.1625095

Manu, F. A., & Sriram, V. (1996). Innovation, marketing strategy, environment, and performance. *Journal of Business Research*, *35*(1), 79–91. Elsevier. https://doi.org/10.1016/0148-2963(95)00056-9

Muangmee, C., Dacko-Pikiewicz, Z., Meekaewkunchorn, N., Kassakorn, N., & Khalid, B. (2021). Green entrepreneurial orientation and innovation in small and medium-sized enterprises (SMEs). *Social Sciences*, *10*(4), 136. MDPI. https://doi.org/10.3390/socsci10040136

Niroumand, M., Shahin, A., Naghsh, A., & Peikari, H. R. (2020). Frugal innovation enablers: A comprehensive framework. *International Journal of Innovation Science*, *12*(1), 1–20. Emerald Publishing Limited. https://doi.org/10.1108/IJIS-10-2019-0099

Ostraszewska, Z., Tylec, A., et al. (2015). Reverse innovation–how it works. *International Journal of Business and Management*, *3*(1), 57–74. International Institute of Social; Economic Sciences. https://www.iises.net/download/Soubory/IJOBM/V3N1/pp57-74_ijobmV3N1.pdf

Pscheidt-Gieseler, T. C., Didonet, S. R., Toaldo, A. M. M., & Martins, T. S. (2018). Innovation orientation influences architectural marketing capabilities and impacts innovation performance. *International Journal of Business Innovation and Research*, *15*(3), 277–300. Inderscience Publishers (IEL). https://doi.org/10.1504/IJBIR.2018.089749

Rolf, S. (2019). National development through global production networks? The case of Dongguan, china. *Political Geography*, pp. *73*, 48–59. Elsevier. https://doi.org/10.1016/j.polgeo.2019.05.006

Sehgal, V., Dehoff, K., & Panneer, G. (2010). The innovators- the importance of frugal engineering-provide new goods and services to the" bottom of the pyramid" customers, which requires a radical rethinking of product development. *Strategy and Business*, *59*(1), 20–37.

Shoham, A., Vigoda-Gadot, E., Ruvio, A., & Schwabsky, N. (2012). Testing an organizational innovativeness integrative model across cultures. *Journal of Engineering and Technology Management*, *29*(2), 226–240. Elsevier. https://doi.org/10.1016/j.jengtecman.2012.01.002

United Nations (2023). Galvanizing MSMEs worldwide by supporting women and youth entrepreneurship and resilient supply chains. https://www.un.org/en/observances/micro-small-medium-businesses-day

Von Janda, S., Kuester, S., Schuhmacher, M. C., & Shainesh, G. (2020). What frugal products are and why they matter: A cross-national multi-method study. *Journal of Cleaner Production*, *246*, 118977. Elsevier. https://doi.org/10.1016/j.jclepro.2019.118977

Wang, C., & Han, Y. (2011). Linking properties of knowledge with innovation performance: The moderate role of absorptive capacity. *Journal of Knowledge Management*, *15*(5), 802–819. Emerald Group Publishing Limited. https://doi.org/10.1108/13673271111174339

Werlang, N. B., & Rossetto, C. R. (2019). The effects of organizational learning and innovativeness on organizational performance in the service provision sector. *Gestão & Produção*, *26*. SciELO Brasil. https://doi.org/10.1590/0104-530X3641-19

Weyrauch, T., & Herstatt, C. (2017). What is frugal innovation? Three defining criteria. *Journal of Frugal Innovation*, *2*(1), 1–17. SpringerOpen. https://doi.org/10.1186/s40669-016-0005-y

Woschke, T., Haase, H., & Kratzer, J. (2017). Resource scarcity in SMEs: Effects on incremental and radical innovations. *Management Research Review*, *40*(2), 195–217. Emerald Publishing Limited. https://doi.org/10.1108/MRR-10-2015-0239

Wu, H., Chen, J., & Jiao, H. (2016). Dynamic capabilities as a mediator linking international diversification and firms' innovation performance in an emerging economy. *Journal of business research*, *69*(8), 2678–2686. Elsevier. https://doi.org/10.1016/j.jbusres.2015.11.003

Zainal, M. (2022). Innovation orientation and performance of Kuwaiti family businesses: Evidence from the initial period of COVID-19 pandemic. *Journal of Family Business Management*, *12*(2), 251–265. Emerald Publishing Limited. https://doi.org/10.1108/JFBM-09-2020-0086

Zeng, J., Phan, C. A., & Matsui, Y. (2015). The impact of hard and soft quality management on quality and innovation performance: An empirical study. *International journal of production economics*, *162*, 216–226. Elsevier. https://doi.org/10.1016/j.ijpe.2014.07.006

Zeschky, M. B., Winterhalter, S., & Gassmann, O. (2014). From cost to frugal and reverse Innovation: Mapping the field and implications for global competitiveness. *Research-Technology Management*, *57*(4), 20–27. Taylor & Francis. https://doi.org/10.5437/08956308X5704235