



The Frugal Innovation Paradox in MSMEs New Product Development

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Abstract. This study examined the influence of entrepreneurial orientation (EO) on new product development (NPD) among MSMEs in Central Java, Indonesia. Furthermore, this research investigated the mediating function of network process quality (NPQ) and the moderating role of frugal innovation (FI) in the relationship between EO and NPD. The data were obtained from 227 MSME owners and managers through a structured questionnaire and subsequently analyzed using partial least squares structural equation modeling (PLS-SEM). The findings revealed that entrepreneurial orientation (EO) significantly contributed to both new product development (NPD) and network process quality (NPQ). FI also has a positive direct effect on NPD, while NPQ positively affects NPD and mediates the relationship between EO and NPD. However, the interaction effect between EO and FI was statistically significant but negative, suggesting that stronger frugal innovation orientation reduced the extent to which entrepreneurial orientation translated into new product development outcomes. These findings indicate that although entrepreneurial orientation encourages opportunity recognition, proactive behavior, and product-related initiatives, excessive emphasis on frugal innovation may limit experimentation and reduce the transformation of entrepreneurial actions into broader new product development outcomes. The study underwrites to the SME innovation literature by showing that frugal innovation is not always an amplifier of entrepreneurial orientation. Instead, under resource-constrained conditions, frugal innovation may function as a strategic boundary condition that limits the marginal impact of EO on NPD.

Keywords: Entrepreneurial Orientation; Frugal Innovation; Network Process Quality; New Product Development; Resource Constraints.

1. INTRODUCTION

Business sustainability among MSMEs requires continuous efforts to improve new product development capabilities. Key issues that entrepreneurs need to address include the variability in demand composition across different periods (Rostami et al., 2020), the costs associated with research and development (Kawasaki et al., 2023), entrepreneurial characteristics (Kruachottikul et al., 2023), contributions from supply chain partners (Murali et al., 2021) and turbulence in technology or markets (Balzano & Marzi, 2023). Entrepreneurs need additional resources to excel in the market. Business owners must engage in proactive and reactive innovation (Hunt, 2011; Hunt & Morgan, 1995). Proactive innovation stems from the entrepreneurial spirit, whereas reactive innovation emerges from a firm's learning process through competition, aiming to dominate specific market segments with an entrepreneurial orientation (Hunt & Madhavaram, 2020). Entrepreneurial orientation highlights the significance of being proactive, innovative, and willing to take risks (Lumpkin & Dess, 1996). However, the reality is that not all MSME business sectors can sustain their operations due to resource constraints, especially in developing countries. Consequently, several pertinent questions emerge:

RQ1: How does entrepreneurial orientation influence new product development? Can achieving success in new product development offer a competitive edge?

RQ2: How does frugal innovation affect the relationship between entrepreneurial orientation and new product development?

RQ3: Which theoretical frameworks can be established to close the knowledge gap regarding how entrepreneurial orientation advances new product development?

Therefore, this investigation is crucial in proposing new insights into the quality of network processes and the moderating effects of frugal innovation, which will be discussed in detail. This study constructs a proposition centered on the novelty derived from the competitive behaviors of companies. Competitiveness is defined as the enduring endeavor of companies to secure a comparative advantage through resources and achieve superior market positioning. Excellence is characterized by the capability to orchestrate relational skills, share collaborator skill, and foster core argument, which are integral to sustaining relationships and are collectively referred to as network capability (Majid et al., 2021). Entrepreneurial initiatives and networking proficiencies can catalyze the amplification of network capabilities, essential for creating and developing networks (Engel et al., 2017). Within the marketing domain, networking signifies the amalgamation of numerous actors and the relational patterns that connect them (Iacobucci & Hopkins, 1992), extending in the business context to denote actor interdependence, the resilience of connection organizes, and the circulation of assets around linkage connections. Additionally, frugal innovation is expected to strengthen new product development. Frugal innovation provides a competitive advantage through cost innovation and strategic choice rather than altering products or creating entirely new market innovations with frugal means (Zeschky et al., 2014). Hence, the originality of this study highlights the reputation of the quality of network processes formed from entrepreneurial orientation, serving as a trigger for the development of network process quality, which is expected to enhance new product development.

Moreover, some prior studies exhibit conflicting results concerning the correlation involving entrepreneurial orientation and new product development. Entrepreneurial orientation is found to have a significant influence on new product development (Aloulou, 2020; Liu & Wang, 2020; Morgan & Anokhin, 2020). Conversely, Wong (2014), observed that environmental turbulence profoundly impacts all three dimensions of entrepreneurial orientation, indicating a direct yet negligible negative relationship between these constructs. Specifically evidence from Saha et al. (2021) suggests that the elements of entrepreneurial orientation, specifically proactivity, and risk-taking, adversely affect performance.

Competitive aggressiveness and autonomy appear to have no significant effect on performance or are deemed irrelevant (Diaz & Sensini, 2020). Furthermore, innovation, proactivity, and risk-taking do not significantly influence non-financial performance (Anwar, 2021). Entrepreneurial orientation is negatively associated with sustained competitive advantage in new product development and market performance through mutual understanding (Niu, 2020). And so, this finding aims to reconcile these discrepancies by offering new insights into the quality of the knowledge process.

This research embraces the Resource-Advantage theory as posited by Hunt and Morgan (1995), which suggests that competitive advantage is attainable when a firm distinguishes itself via unique strategies (Aharoni, 1993). Such unique strategies can emerge from the interplay of network position (Low & Johnston, 2009), firm-specific competencies (Souitaris, 2002), and network-derived competitive advantage (Pillai, 2006). In future research, these elements are proposed to synergize to establish a collaborative innovation network (Galaso & Kovářík, 2018; Najafi-Tavani et al., 2018), which could significantly influence product innovation capabilities or process quality. This study focuses on actors within various MSME sectors in Central Java, Indonesia, recognizing the country's status as a developing nation where financial and tangible resources are crucial for research development. The study posits that enhancing network quality can stimulate product development if entrepreneurs exhibit proactive, innovative, and risk-taking behaviors indicative of entrepreneurial orientation.

While several scholars have addressed new product development, previous research has predominantly concentrated on corporate typical invention (Ferreras-Méndez et al., 2021). Furthermore, existing theories, including those predicated on firm resources (Barney, 1986) and resource dependence, are critiqued for their lack of testable propositions. Hunt and Derozier (2004) highlight that many findings overlook the significance of market segments in the competitive framework. Consequently, this investigation delves into the roles of network process quality and frugal innovation, aiming to delineate novel propositions concerning how entrepreneurial orientation, interfaced with network process quality, catalyzes new product development, emphasizing the pivotal role of frugal innovation.

2. LITERATURE REVIEW

A perspective Resource advantage theory of competition

Within the framework of the Resource-Advantage Theory of Competition (RATOC), the quality of network processes played a significant mediating role in strengthening the connection among entrepreneurial orientation (EO) and new product development (NPD). The

R-A theory, introduced by Hunt (1995), suggests that competition between firms does not solely depend on the efficient allocation of resources but rather on the firm's ability to strategically leverage heterogeneous resources to achieve competitive advantage. In this context, strong EO—characterized by innovation, proactiveness, and risk-taking—can enhance a firm's capabilities, particularly MSMEs, in creating innovative products through effective network utilization (Mostafiz et al., 2023). High-quality network processes facilitated closer collaboration among business actors, supporting the exchange of information, knowledge, and access to scarce resources, which in turn strengthened firms' abilities in NPD (Liu et al., 2022). From the perspective of RATOC, effective networks served as assets that were difficult for competitors to replicate, thus creating a comparative advantage in the marketplace (Hunt & Morgan, 1995). Previous studies found that MSMEs with high EO were more successful in managing complex network relationships to maximize the potential for new product innovation (Zhai et al., 2018). Therefore, the quality of network processes not only acted as a channel for leveraging EO but also served as a catalyst that optimized the use of firm resources to achieve superior innovation performance. This aligns with the principles of RATOC, which emphasize that sustainable competitive advantage can be achieved through a unique combination of strong EO and robust networking strategies, particularly in dynamic and uncertain business environments (Hunt, 2011). Through strategic collaboration within networks, firms can achieve greater synergies in NPD, ultimately enhancing financial performance and ensuring sustainable market leadership.

Entrepreneurial Orientation and New Product Development

Entrepreneurial orientation (EO) is considered pivotal in augmenting firm performance within the current economy (Boso et al., 2013). For enterprises, the success of new product development (NPD) is deemed critical (Ahmad et al., 2018; Ferreras-Méndez et al., 2021). NPD, the complex process encompassing ideation, product development, prototyping, testing, and implementation, is essential for continual business evolution. Enterprises must consistently evaluate, revise, and refresh their product portfolios. EO significantly bolsters business performance and other salient firm-level outcomes in today's competitive landscape, characterized by increasingly abbreviated product life cycles (Ferreras-Méndez et al., 2021).

Organizations exhibiting a high degree of entrepreneurial orientation are inclined to invest in developing capabilities that enable the continuous skimming and checking of the environment to classify novel opportunities and penetrate markets expediently with innovative products or services (Elenurm, 2012). EO enhances an organization's focus on identifying and seizing opportunities. EO encapsulates the entrepreneurial aspects of decisions, actions, and

behaviors that culminate in introducing new products. Proactiveness refers to an enterprise's capacity to anticipate and respond to future market demands and opportunities by advancing, pioneering new market entries, and sustaining technological leadership (Solano Acosta et al., 2018). Conversely, innovativeness is characterized by a firm's efforts in generating unique concepts and engaging in investigation that yields new products, services, or processes. EO is a driving force behind the mechanisms contributing to venture success, product innovation, and firm performance (Amaya Rivas et al., 2020).

H1: Entrepreneurial orientation will have a positive relationship with new product development.

Entrepreneurial Orientation and Network Process Quality

Network entrepreneurial orientation cultivates group sequences and actions that engender prospects for networked practices. This is accomplished by nurturing cooperative engagement in proactive endeavors to innovate and undertake venturesome ventures across the efficacious utilization and amalgamation of additional incomes (Monferrer et al., 2021). Entrepreneurial orientation encapsulates the procedures, strategies, and decisions facilitating entry into unexplored markets (Morgan & Anokhin, 2023). The core premise of entrepreneurial orientation (EO) is that entrepreneurs devise strategies to exploit on market prospects by innovating ahead of their competitors (Ta'Amnha et al., 2023). In this context, a firm's EO is a pivotal strategic posture supporting market agility, given that the new product development (NPD) process is inherently risky and entrepreneurial (Ferrerias-Méndez et al., 2022).

The heterogeneity within network configurations may enable or impede the effectiveness of accessing cross-border resources (Jiang et al., 2018). Furthermore, the social connections a firm's EO establishes within its network can significantly influence the degree to which EO impacts the acquisition of network resources. Research in entrepreneurship from a network perspective highlights how network attributes, such as mechanical places, cohesiveness, trust, and embeddedness, significantly influence entrepreneurial strategies and their outcomes (Wincent et al., 2014).

H2: Entrepreneurial orientation has a positive effect on network process quality

Frugal Innovation and New Product Development

The diffusion of frugal inventions depends on the critical need to present an appealing value proposition. Businesses offering inexpensive products and services often face competition from traditional competitors and 'non-consumption.' The latter refers to potential customers who may need more resources to purchase the offered product or service or access the necessary infrastructure. In the context of new product development, frugal innovation

involves creating low-cost goods, processes and designs primarily targeting base-of-the-pyramid (BOP) firms in development nations. It simplifies processes and products to reduce costs without compromising quality (Tiwari et al., 2014). Frugal innovation is driven by the desire to address challenges in developing markets and to provide viable, affordable, and durable solutions. Innovators often start by identifying the problem that needs resolution and emphasize accessibility, affordability, and adaptability for growing markets (Brem et al., 2020; Cadeddu et al., 2019).

Brand resonance represents the level of consumers' psychological attachment to a brand, indicated by repeated purchasing behavior, interest in obtaining brand information, and other forms of customer engagement that reflect brand loyalty (Keller et al., 2011). Brand feelings describe consumers' emotional responses to a brand, whereas brand resonance refers to the strength and persistence of the consumer-brand relationship (Abd Aziz & Yasin, 2010). Consequently, developing a strong bond between consumers and the brand is essential for fostering long-term relationships (Keller et al., 2011). New product development plus frugal innovation are mutually reinforcing, especially when devising practical and cost-effective solutions for emerging markets. Frugal innovation is defined as creating affordable, durable products tailored to the needs of consumers in developing countries (Lim & Fujimoto, 2019). The new product development approach in frugal innovations typically emphasizes flexibility, affordability, and utility, addressing these markets' unique constraints and challenges. By streamlining products and processes, frugal innovation aims to deliver high-quality solutions at lower costs, promoting sustainable development and improving the living standards of low-income consumers (Brem et al., 2020; Lim & Fujimoto, 2019). From this relationship, we have the following hypothesis:

H3: Frugal innovation has a positive effect on new product development.

Moderating Role of Frugal Innovation

Frugal innovation, or engineering, simplifies a product's complexity and production costs. This approach results in durable and more affordable items, particularly beneficial for consumers in less affluent countries, often by removing unnecessary features (Tiwari et al., 2014). Frugal innovation aims to offer goods and services at lower prices without compromising quality, making them accessible to a broader audience. The quest for economic solutions, alongside globalization and the increasing wealth in emerging nations, has boosted the appeal of this concept. Frugal innovation creates practical, cost-effective, and environmentally friendly sustainable products, techniques, and services innovation (Ta'Amnha et al., 2023).

Frugal innovation may alter the extent to which EO translates into NPD. On the one hand, frugality may help entrepreneurially oriented firms convert their initiatives into practical and marketable products more efficiently. On the other hand, a strong frugal logic may also limit experimentation, reduce feature variety, and constrain the strategic freedom typically associated with EO. Because FI can shape how entrepreneurial behavior is operationalized in resource-constrained settings, it is reasonable to expect a moderation effect. Thus, the hypothetical study we developed from the role of moderation of frugal innovation is:

H4. Frugal innovation moderates the relationship between entrepreneurial orientation and new product development.

Entrepreneurial Orientation, Network Process Quality and New Product Development

The diverse array of tasks that a company performs from "identifying a technological or market opportunity" to "initiating production" of a unique product or service is collectively known as product development (Browning & Ramasesh, 2007; Chen et al., 2008). Firms tackling new product development challenges must engage in effective collaboration or competition within their networks. In competitive industries, companies often specialize in certain production aspects before participating in vertical or horizontal collaborations, sometimes aiding rival firms, to satisfy market demands. Collaborative network engagement is essential for developing the competencies needed for new product development and for becoming comprehensive system suppliers, thus optimizing profit through shared network risks and rewards. (Browning & Ramasesh, 2007; Miranda-Ackerman et al., 2017)

Research has shown that involving key suppliers and partners early in the new product development process enhances the fundamental business drivers: time, cost, and product functionality (Miranda-Ackerman et al., 2017). A predominant trend in the industry is the development of new products within networks, leveraging the accumulated knowledge, strong competencies, efficient resource use, core technologies, organizational learning, and social capital available within these networks. Moreover, an innovative environment is crucial for NPD.

Entrepreneurial orientation, reflected through proactive behavior, innovativeness, and risk-taking tendencies, plays an important role in supporting new product development. Network process quality, which involves effective system and technology integration, adherence to standards and regulations, disruption management, and network monitoring, functions as a mediating mechanism that enables EO to contribute positively to NPD. Previous studies have provided empirical evidence that EO has a significant positive influence on NPD (Etriya et al., 2019; Mu et al., 2017; Silva et al., 2022). Furthermore, network process quality

serves as an important facilitator by encouraging collaboration and resource exchange required for successful NPD (Rosita et al., 2023; Silva et al., 2022). In addition, frugal innovation, which focuses on cost-efficient and resource-conscious solutions, may enhance the relationship between EO and NPD by helping firms respond to market demands in a faster and more effective manner (Wang et al., 2023). Therefore, this study proposes that the mediating role of network process quality provides a pathway through which entrepreneurship-oriented actions can be transformed into improved new product development outcomes. Thus, the hypothesis we develop is as follows:

H5: Network process quality has a positive effect on new product development.

H6: Network process quality mediates the effect of entrepreneurial orientation on new product development.

The following conceptual framework was built to develop this study as shown in figure 1 below:

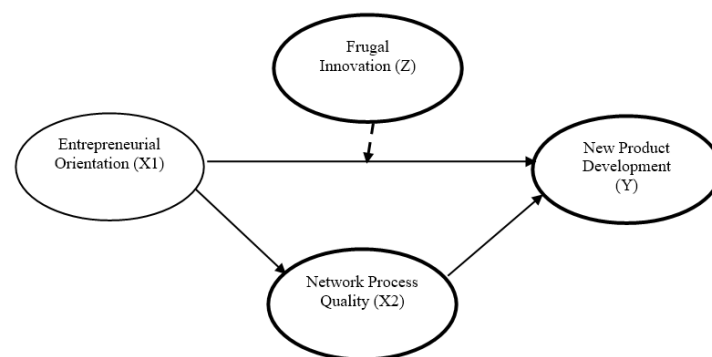


Figure 1. Conceptual Framework.

3. RESEARCH METHOD

Data Collection Samples and Techniques

This study employed a quantitative research approach and utilized Partial Least Squares Structural Equation Modeling (PLS-SEM) for data analysis. The research was conducted among 227 Micro, Small, and Medium Enterprises (MSMEs) located in Central Java, Indonesia. The respondents were drawn from four business sectors, namely the creative industry (36 enterprises), trading (84 enterprises), culinary sector (42 enterprises), and other sectors (65 enterprises). Data collection was carried out through a structured questionnaire distributed to business owners and managers. The study used purposive sampling, where respondents were selected based on predetermined criteria relevant to the research objectives. This sampling approach is consistent with previous research that applied PLS-SEM for theory testing, development, and prediction-oriented analysis (Hair et al., 2011). The questionnaire

utilized a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree to measure respondents' perceptions of the research indicators. The respondents' demographic characteristics and business profiles are summarized in Table 1.

Table 1. Respondent's Profile (n=227).

No.	Description	Characteristics	Total	%
1	Sex	Male	128	56.4
2		Female	99	43.6
	Age	< 20 years old	27	11.9
		> 20-30 years old	45	19.8
		> 30-40 years old	86	37.9
3		> 40-50 years old	65	28.6
		> 50 years old	4	1.8
	Education	Senior High School	48	21.1
		Diploma	50	22.0
		Bachelor's degree	49	21.6
		Master's degree	55	24.2
4		Doctoral Degree	6	2.6
		Others	19	8.4
	Length of business operation	< 3 years	27	11.9
		> 3 to 5 years	86	37.9
		> 5 to 10 years	17	7.5
		> 10 years	97	42.7
5	Income/month	< IDR 10 million	68	30.0
		> IDR 10 million to 25 million	127	55.9
		> IDR 25 million to 100 million	23	10.1
		> IDR 100 million to 200 million	6	2.6
		> IDR 200 million	3	1.3
6	Business Sector	Creative Industry	36	15.9
		Trading	84	37.0
		Culinary	42	18.5
		Others	65	28.6

Sources: Data processed, 2026.

The respondent outline shows that the model was conquered by male respondents, accounting for 56.4%, while female respondents represented 43.6%. In rapports of age, the principal quantity of respondents was in the 30–40 years age group (37.9%), tailed by those aged 40–50 years (28.6%) and 20–30 years (19.8%), indicating that most respondents were within productive working age. Regarding educational background, respondents holding a master's degree constituted the largest group (24.2%), followed by diploma holders (22.0%), bachelor's degree holders (21.6%), and senior high school graduates (21.1%), whereas only a small proportion had doctoral degrees (2.6%) or other educational backgrounds (8.4%). Based on business age, most firms had been functional for more than 10 years (42.7%), followed by those operating for 3 to 5 years (37.9%), suggesting that most of the sampled businesses were relatively well established. In terms of monthly income, most respondents reported earnings

between IDR 10 million and IDR 25 million (55.9%), while 30.0% earned less than IDR 10 million, and only a small percentage earned more than IDR 25 million. Finally, in terms of business sector, trading represented the largest proportion of the sample (37.0%), followed by other sectors (28.6%), culinary businesses (18.5%), and creative industries (15.9%). Overall, these findings suggest that the respondents were predominantly male, in their productive age, relatively well educated, and involved in established businesses, with trading as the most dominant sector.

Measurements

The validation process included assessments of both convergent and discriminant validity. Convergent validity was examined by assessing the consistency of two measurements of the same concept, requiring a factor loading of 0.7 and an Average Variance Extracted (AVE) value exceeding 0.5 (Hair et al., 2011). For discriminant validity, the procedure involved comparing the AVE values of two different creates against the square of their correlation, adhering to the criteria set by Fornell and Larcker (1981), which dictate that the square root of the AVE for any given factor should be larger than the correlation values between factors in the model. Additionally, the test for normality was satisfied, and Cronbach's alpha exceeded 0.7, aligning with the acceptance threshold where a minimum of 0.6 is deemed acceptable (Hair et al., 2011). Items representing variable quantities were adapted from previous research and tailored to align with the study's goals. In addition, a five-point Likert scale was spent to evaluate every dimension. The study variables and their corresponding quantity values are detailed in Table 2 below.

Table 2. Variable Measurement Instruments.

Variables	Dimension	Indicators	Sources
Entrepreneur Orientation (X)	Risk-taking (X1.1)	Our firm is willing to take calculated risks in pursuing new business opportunities.	Ferreras-Méndez et al. (2021); Karami et al. (2020); Liu and Wang (2020)
	Proactiveness (X1.2)	Our firm actively takes initiative in responding to emerging market opportunities ahead of competitors.	
	Innovativeness (X1.3)	Our firm frequently seeks and supports new ideas for products, services, or business processes.	
	Competitive initiative (X1.4)	Our firm moves aggressively to strengthen its market position when promising opportunities arise.	
Network Process Quality (X2)	Coordination quality (X2.1)	Our firm maintains effective coordination with external partners in carrying out business activities.	Isichei (2020); Javidroozi et al. (2019); Zardini et al. (2016)

Frugal Innovation (Z)	Information sharing (X2.2)	Our firm exchanges timely and accurate information with network partners to support operations and decision-making.	Albert (2022); Dangelo and Magnusson (2021); Le Bas (2021); Sarkar (2021)
	Responsiveness to disruption (X2.3)	Our firm and its network partners respond quickly and effectively when operational disruptions occur.	
	Monitoring and relationship control (X2.4)	Our firm regularly monitors the performance and reliability of its network partners.	
	Cost-efficient innovation (Z1)	Our firm develops products or solutions by minimizing costs without sacrificing core functionality.	
	Resource efficiency (Z2)	Our firm makes efficient use of limited resources when developing products or services.	
New Product Development (Y)	Simplicity and functionality (Z3)	Our firm emphasizes simple and functional product designs that meet essential customer needs	Amaya Rivas et al. (2020); Liu and Wang (2020); Morgan and Anokhin (2020)
	Product development capability (Y.1)	Our firm is able to develop new products that match market needs.	
	Speed of development (Y.2)	Our firm is able to introduce new products to the market in a timely manner.	
	Product novelty (Y.3)	Our firm regularly develops products with new or improved features.	
	Product development success (Y.4)	Our newly developed products contribute positively to our business performance.	

Sources: Data processed, 2026.

Data Analysis

The collected data were processed using Partial Least Squares Structural Equation Modeling (PLS-SEM) through the SmartPLS 3.0 application. PLS-SEM was selected as the analytical approach because the proposed research model involved direct, mediating, and moderating relationships among latent constructs. Furthermore, PLS-SEM is particularly suitable for prediction-oriented studies and can effectively handle relatively complex models involving small to medium sample sizes (Hair, 2019). The analysis was performed in two sequential stages. First, the measurement model (outer model) was assessed to evaluate the reliability and validity of the constructs by examining outer loadings, Cronbach's alpha, composite reliability, average variance extracted (AVE), and discriminant validity. Second, the structural model (inner model) was evaluated to test the proposed hypotheses by analysing path

coefficients, t-values, and p-values derived from the bootstrapping procedure. This analytical approach allowed the study to examine the direct effects of entrepreneurial orientation, frugal innovation, and network process quality on new product development, while also assessing the mediating role of network process quality and the moderating effect of frugal innovation in the proposed research model.

4. RESULT AND DISCUSSION

Discriminant Validity

Table 3 shows the discriminant validity test. The results indicate that the square root of the Average Variance Extracted (AVE) for each construct is slightly higher than the correlations between that construct and the other constructs. Specifically, the square root of AVE for Entrepreneurial Orientation (0.825) is higher than its correlations with Frugal Innovation (0.822), New Product Development (0.816), and Network Process Quality (0.607). Likewise, the square root of AVE for Frugal Innovation (0.848) exceeds its correlations with Entrepreneurial Orientation (0.822), New Product Development (0.829), and Network Process Quality (0.681). A similar pattern is also found for New Product Development (0.841) and Network Process Quality (0.849), where each diagonal value is higher than the inter-construct correlations. These findings indicate that the model formally satisfies the Fornell–Larcker criterion for discriminant validity. However, several inter-construct correlations, particularly among Entrepreneurial Orientation, Frugal Innovation, and New Product Development, are very close to the diagonal values. This suggests that although discriminant validity is statistically acceptable, the separation among these constructs is relatively weak and should therefore be interpreted with caution. Overall, the model meets the minimum requirement for discriminant validity, but the evidence is only marginal rather than strong. Overall, the model formally meets the Fornell–Larcker criterion; however, the closeness of several inter-construct correlations to the square root of AVE values indicates that discriminant validity is only marginal and not particularly robust.

Table 3. Discriminant Validity.

Variable	EO	Frugal Innovation	NPD	NPQ
EO	0.825			
Frugal Innovation	0.822	0.848		
NPD	0.816	0.829	0.841	
NPQ	0.607	0.681	0.709	0.849

Source: Data Processed (2026)

Convergent Validity

To evaluate the reliability of the constructs in the measurement model, this study employed Cronbach's alpha and composite reliability. The results show that Cronbach's alpha values range from 0.805 to 0.872, exceeding the recommended threshold of 0.70 and In addition, the composite reliability values range from 0.885 to 0.912, which are also above the minimum acceptable level of 0.70. These results indicate that all constructs demonstrate adequate internal consistency reliability, as presented in Table 4.

Table 4. Convergent validity, Cronbach's Alpha, and AVE.

Construct	Indicator	STD. Loading	Cronbach's Alpha	Status
Entrepreneur Orientation (X) AVE = 0.680 CR = 0.895	X.1	0.777	0.843	Valid
	X.2	0.851		Valid
	X.3	0.866		Valid
	X.4	0.802		Valid
New Product Development (Y) AVE = 0.707 CR = 0.906	Y.1	0.866	0.862	Valid
	Y.2	0.813		Valid
	Y.3	0.844		Valid
	Y.4	0.839		Valid
Network Process Quality (X2) AVE = 0.721 CR = 0.912	X2.1	0.867	0.872	Valid
	X2.2	0.848		Valid
	X2.3	0.837		Valid
	X2.4	0.843		Valid
Frugal Innovation (Z) AVE = 0.720 CR = 0.885	Z.1	0.888	0.805	Valid
	Z.2	0.811		Valid
	Z.3	0.844		Valid
R-square (R^2) – NPD		0.790		
R-squared (R^2) – NPQ		0.369		
Adjusted R Square - NPD		0.786		
Adjusted R Square – NPQ		0.366		

Source: Data Processed (2026).

Table 4 shows that the standardized loading values for all indicators range from 0.777 to 0.888, exceeding the recommended cut-off value of 0.70. This indicates that all indicators have satisfactory item reliability. Furthermore, the average variance extracted (AVE) values for entrepreneurial orientation (0.680), network process quality (0.721), frugal innovation (0.720), and new product development (0.707) are all above the threshold of 0.50. Following the criteria proposed in the measurement literature, these values confirm that each construct explains more than 50% of the variance in its indicators, thereby demonstrating acceptable convergent validity. With regard to the structural model, the adjusted R-squared value for new product development is 0.786, indicating that 78.6% of the variance in new product development is explained by the predictors included in the model, while the remaining 21.4% may be attributed

to other factors outside the scope of this study. Meanwhile, the adjusted R-squared value for network process quality is 0.366, suggesting that 36.6% of the variance in network process quality is explained by the model, whereas the remaining 63.4% may be influenced by variables not examined in this research. Overall, Table 4 indicates that the measurement model has acceptable reliability and convergent validity, while the structural model demonstrates strong explanatory power for new product development and moderate explanatory power for network process quality.

Hypothesis Result

Based on the hypothesis testing results presented in Table 5, all proposed relationships were found to be statistically significant. Hypothesis H1, which states that entrepreneurial orientation (EO) positively affects new product development (NPD), was supported with a path coefficient of 0.263, a t-value of 3.459, and a p-value of 0.001. Hypothesis H2, which proposes that EO positively affects network process quality (NPQ), was also supported, with a path coefficient of 0.607, a t-value of 8.219, and a p-value of less than 0.001, indicating a strong and significant relationship. t-values above 1.96 indicate significance at the 5% level, while values above 2.58 indicate significance at the 1% level. Hypothesis H3, which states that frugal innovation (FI) positively affects NPD, was supported with a path coefficient of 0.260, a t-value of 3.831, and a p-value of less than 0.001. Hypothesis H4, which examines the moderating effect of frugal innovation on the relationship between EO and NPD, produced a negative coefficient of -0.071 with a t-value of 3.582 and a p-value of less than 0.001.

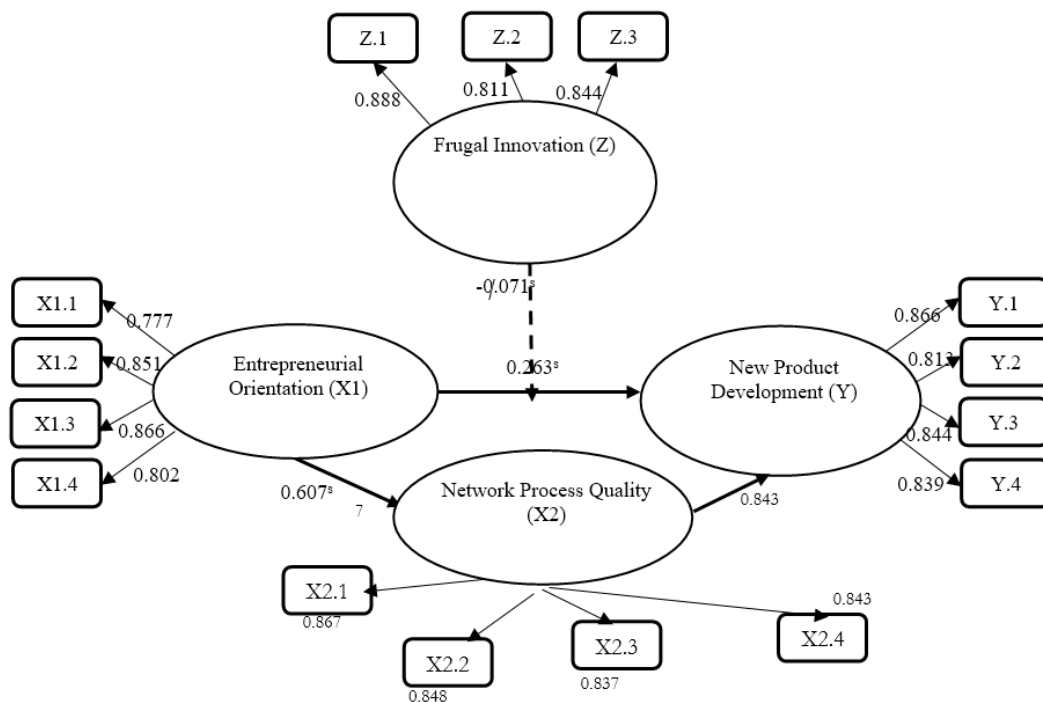
This indicates that the moderation effect is statistically significant but negative in direction. Therefore, frugal innovation weakens rather than strengthens the positive effect of EO on NPD. As a result, H4 can only be regarded as supported if the hypothesis merely predicted moderation; however, if the hypothesis specifically predicted a positive moderating effect, then it is not supported in directional terms. Furthermore, Hypothesis H5, which proposes that network process quality positively affects NPD, was supported with a path coefficient of 0.250, a t-value of 4.647, and a p-value of less than 0.001. Finally, Hypothesis H6, which examines the indirect effect of EO on NPD through NPQ, was also supported, with an indirect coefficient of 0.152, a t-value of 3.459, and a p-value of 0.001. These results indicate that EO affects NPD both directly and indirectly through NPQ. Overall, the hypothesis testing results confirm that the structural relationships proposed in the model are statistically significant at the recommended threshold.

Table 5. Hypothesis Testing.

Hypothesis	Original Sample	Standard Deviation	T Value	P Value
H1: EO $\rightarrow$ NPD	0.263	0.076	3.459	0.001
H2: EO $\rightarrow$ NPQ	0.607	0.074	8.219	0.000
H3: FI $\rightarrow$ NPD	0.260	0.068	3.831	0.000
H4 (Mo): EO*FI $\rightarrow$ NPD	-0.071	0.020	3.582	0.000
H5: NPQ $\rightarrow$ NPD	0.250	0.054	4.647	0.000
H6: EO $\rightarrow$ NPQ $\rightarrow$ NPD	0.152	0.044	3.459	0.001

Source: data processed, 2026

This study examined how entrepreneurial orientation (EO), frugal innovation (FI), and network process quality (NPQ) shape new product development (NPD) among MSMEs in Central Java, Indonesia. Overall, the findings indicate that EO contributes to NPD both directly and indirectly through NPQ, while FI has a positive direct effect on NPD but a negative moderating effect on the relationship between EO and NPD. These results suggest that product development in MSMEs is not driven by a single strategic orientation, but by the way multiple organizational capabilities and resource-deployment logics interact under conditions of constraint. From the perspective of the Resource-Advantage Theory of Competition, the findings imply that EO functions as a strategic capability, NPQ as a relational capability, and FI as a constraint-based innovation logic that can both enable and limit the value-creation potential of other capabilities. Here in Figure 3, we present below the full structural model of new product development.

**Figure 3.** Full structural model of new product development.

The first finding shows that EO has a positive and significant effect on NPD ($\beta = 0.263$, $p = 0.001$), supporting H1. This result indicates that MSMEs with stronger entrepreneurial orientation are more likely to generate product development outcomes because they are more willing to pursue opportunities, act proactively, and take calculated risks in uncertain markets. In practical terms, EO appears to strengthen the firm's capacity to identify market gaps, mobilize initiative, and translate opportunity-seeking behavior into product-related actions. This interpretation is broadly consistent with prior studies showing that entrepreneurial posture supports innovation and product-related performance (Karami & Tang, 2019). It is also in line with studies emphasizing that firms with stronger entrepreneurial orientation tend to be more adaptive and more responsive to market change during product development processes (Budiaty et al., 2022; Ferreras-Méndez et al., 2021). Within the Resource-Advantage Theory framework, this finding suggests that EO represents a valuable internal capability that helps firms' sense and exploit market opportunities more effectively than less entrepreneurially oriented rivals.

The second finding confirms that EO has a positive and significant effect on NPQ ($\beta = 0.607$, $p < 0.001$), supporting H2. This is one of the strongest relationships in the model and indicates that entrepreneurially oriented firms are more capable of developing effective network processes with external actors. Such firms appear to coordinate more actively with suppliers, customers, and business partners and to use these relationships as part of their innovation efforts. This interpretation is consistent with earlier work suggesting that entrepreneurial firms are more likely to establish collaborative ties and maintain productive stakeholder relationships that support innovation activity (Abu-Rumman et al., 2021; Daradkeh & Mansoor, 2023). It also aligns with findings that entrepreneurial orientation encourages more dynamic and effective collaboration in innovation-related processes. From the standpoint of Resource-Advantage Theory, NPQ can be viewed as a relational and process-based capability through which firms coordinate external resources that they do not fully own. The strong effect of EO on NPQ therefore suggests that entrepreneurial orientation does not operate only as an internal posture, but also helps shape the quality of resource integration across the firm's network.

The third finding shows that FI has a positive and significant direct effect on NPD ($\beta = 0.260$, $p < 0.001$), supporting H3. This indicates that frugal innovation contributes to product development by encouraging firms to create affordable, accessible, and functional solutions under resource constraints. In MSME settings, where financial and technological limitations are common, a frugal approach may support the development of products that are simpler, more market-relevant, and more feasible to commercialize. This interpretation is broadly consistent

with prior studies arguing that frugal innovation can generate practical and affordable products for wider segments of consumers (Neumann et al., 2020; Yi, 2021). It also agrees with research suggesting that resource constraints can stimulate creative problem solving and flexible product development when firms are able to innovate efficiently (Fang et al., 2021; Wu et al., 2022). In Resource-Advantage Theory terms, FI may be understood as a capability for efficient resource deployment, allowing firms to convert limited inputs into offerings that still create value in the marketplace.

The fourth finding is theoretically the most important. Although FI has a positive direct effect on NPD, the interaction between EO and FI is negative and significant ($\beta = -0.071$, $p < 0.001$), indicating that FI weakens rather than strengthens the positive effect of EO on NPD. Therefore, H4 is supported only in the sense that a moderating effect exists; however, it is not supported if the hypothesis expected a positive moderating direction. This result suggests that frugal innovation functions as a boundary condition on the effectiveness of EO. A plausible explanation is that EO encourages experimentation, proactive market action, and opportunity-seeking behavior, whereas FI emphasizes simplicity, cost discipline, and resource minimization. When FI becomes stronger, entrepreneurial initiatives may be filtered through stricter efficiency logic, reducing the extent to which EO can be translated into broader or more differentiated product development outcomes. In this sense, MSMEs may still innovate under high frugality, but their innovation is likely to be narrower in scope and more strongly oriented toward affordability and essential functionality than toward expansive product development. This negative moderation provides an important extension to the Resource-Advantage Theory of Competition because it shows that strategic capabilities do not always combine in an additive or mutually reinforcing way. Under resource-constrained conditions, one capability may constrain the value-creation potential of another. This is a more nuanced interpretation of competitive advantage than a simple assumption that more capabilities will always lead to better outcomes.

The fifth finding indicates that NPQ positively affects NPD ($\beta = 0.250$, $p < 0.001$), supporting H5. This result shows that high-quality network processes contribute meaningfully to product development outcomes. In MSMEs, where firms often depend on external partners for information, supplies, knowledge, and market access, product development is likely to be stronger when the firm can maintain effective coordination, information exchange, and responsiveness within its network. This interpretation is consistent with studies showing that collaboration quality among suppliers, business partners, and customers improves product development effectiveness and alignment with market needs (Abu-Rumman et al., 2021; Chen

et al., 2022; Daradkeh & Mansoor, 2023). It is also supported by research emphasizing that stronger collaborative processes help firms generate products that are better accepted by the market (Alshebami, 2023; Ferreras-Méndez et al., 2022). Within Resource-Advantage Theory, this finding reinforces the argument that competitive outcomes are shaped not only by internal resources, but also by the firm's ability to organize and deploy relational capabilities that improve access to valuable external resources.

The sixth finding confirms that EO affects NPD indirectly through NPQ ($\beta = 0.152$, $p = 0.001$), supporting H6. Because the direct effect of EO on NPD remains significant, the mediation can be interpreted as partial rather than full. This means that EO enhances NPD through two complementary routes: first, by directly encouraging proactive and opportunity-driven product initiatives, and second, by improving the quality of network processes through which external resources, information, and collaboration are mobilized. This interpretation is consistent with evidence suggesting that entrepreneurially oriented firms tend to build stronger collaborative structures and reciprocal stakeholder relationships that support innovation performance (Gunawan et al., 2016; Kock & Gemünden, 2021). The mediation result is particularly important because it clarifies the mechanism linking EO to NPD. Rather than affecting product development only through internal strategic posture, EO also becomes effective when it is translated into relational and process capabilities. In Resource-Advantage Theory terms, this means that comparative advantage emerges not merely from possessing an entrepreneurial orientation, but from converting that orientation into superior patterns of resource coordination.

Taken together, the findings offer three broader theoretical implications. First, they confirm that EO is an important strategic capability for MSMEs seeking to strengthen product development. Second, they show that NPQ is not a peripheral variable, but a critical relational mechanism through which EO is converted into NPD outcomes. Third, and most importantly, they reveal that FI plays a dual role: it directly supports NPD, yet it also weakens the marginal contribution of EO to NPD. This means that frugal innovation should not be interpreted as an unconditional enhancer of entrepreneurial outcomes. Instead, its value depends on how it interacts with other organizational capabilities. Such a finding contributes to the Resource-Advantage Theory of Competition by suggesting that the performance effect of resource configurations is conditional and context-dependent. In MSMEs facing scarcity, efficiency-oriented innovation may support value creation directly, but may simultaneously limit the strategic freedom through which entrepreneurial orientation generates broader innovation outcomes.

Overall, the results suggest that successful NPD in MSMEs depends on achieving an appropriate balance between entrepreneurial initiative, network coordination, and frugal resource deployment. Firms that are entrepreneurially oriented and able to mobilize high-quality network processes appear better positioned to create product development outcomes. However, when frugality becomes too dominant, it may narrow the scope through which entrepreneurial initiative can be translated into innovation. This balance-oriented interpretation offers a more realistic understanding of how MSMEs compete under resource constraints and provides a more meaningful theoretical contribution than a purely linear reading of the results.

5. CONCLUSION

This study examined how entrepreneurial orientation (EO), frugal innovation (FI), and network process quality (NPQ) shape new product development (NPD) among MSMEs in Central Java, Indonesia. The findings provide clear answers to the three research questions and offer a more precise explanation of how strategic orientation, relational capability, and resource-constrained innovation interact in the development of new products. First, regarding RQ1, the findings indicated that EO positively influenced NPD through both direct and indirect pathways. EO demonstrated a positive and significant direct effect on NPD, suggesting that firms with a stronger entrepreneurial orientation were more capable of recognizing opportunities, acting proactively, and transforming strategic initiatives into successful product development outcomes. Furthermore, EO had a strong positive effect on NPQ, which subsequently contributed positively to NPD. The indirect effect of EO on NPD through NPQ was also found to be significant. These results indicated that EO enhanced NPD not only as an internal strategic orientation but also through improved relational capabilities and process mechanisms. As NPD was strengthened by EO and facilitated by high-quality network processes, firms could gain a competitive advantage by responding more effectively to market demands, developing more strategic offerings, and improving their market position.

Second, regarding RQ2, FI plays a double role in the model. On the one hand, FI has a positive and significant direct effect on NPD, suggesting that affordable, accessible, and resource-efficient innovation helps MSMEs develop products under conditions of scarcity. On the other hand, the interaction effect between EO and FI is significant and negative, indicating that FI weakens rather than strengthens the positive effect of EO on NPD. Thus, FI operates as a significant moderating element, but not in a reinforcing direction. This means that while frugal innovation supports product development directly, a stronger frugal orientation may simultaneously restrict the extent to which entrepreneurial behavior can be translated into

broader or more differentiated product development outcomes. In practical terms, FI helps firms innovate under constraints, but it may also narrow the strategic space available for experimentation and expansion.

Third, in response to RQ3, the learning cares the use of the Resource-Advantage Theory of Competition as a relevant theoretical framework for explaining how EO advances NPD. The findings suggest that EO can be understood as a strategic capability, NPQ as a relational and process-based capability, and FI as a resource-deployment logic under constrained conditions. More importantly, the results refine this theoretical perspective by showing that strategic capabilities do not always interact in an additive or uniformly reinforcing manner. EO improves NPD directly and indirectly through NPQ, but the negative moderation of FI indicates that one capability may constrain the effectiveness of another when firms operate under strong frugality pressures. Therefore, the study closes part of the knowledge gap by showing that NPD in MSMEs is best explained not by a single capability, but by the configuration and interaction of entrepreneurial, relational, and frugal capabilities. Overall, the study makes three main contributions. Empirically, it demonstrates that EO, NPQ, and FI all matter for NPD, although in different ways. Theoretically, this study extended the Resource-Advantage Theory of Competition by demonstrating that competitive advantage among MSMEs was developed through both capability building and capability interactions, including interactions that did not necessarily produce reinforcing effects. Practically, the findings suggested that MSME owners and managers should not depend solely on entrepreneurial initiatives but should also enhance network process quality and strategically manage frugal innovation to ensure that efficiency improvements do not hinder the broader developmental benefits derived from EO.

This study is not without limitations. The use of purposive sampling limited the generalizability of the findings, as the sample selection was based on specific criteria rather than random procedures. Furthermore, the focus on MSMEs in Central Java restricted the applicability of the results to broader geographic and business contexts. In addition, the cross-sectional research design limited the ability to establish strong causal relationships among the studied variables. Future studies may extend this model to other regions or countries, use longitudinal data, and further examine whether the negative moderating role of FI remains stable across industries and institutional settings. Future research may also refine the measurement of the focal constructs to strengthen the conceptual precision of the model. In conclusion, the study shows that EO advances NPD directly and indirectly through NPQ, that FI supports NPD directly but weakens the EO–NPD relationship, and that the Resource-Advantage Theory of Competition offers a useful but more nuanced framework for

understanding how MSMEs generate competitive advantage through product development under resource constraints.

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