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The impacts of customer participation and innovation capabilities on new product performance

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Abstract
This study investigates how distinct forms of customer participation, i.e.: functional, emotional, and knowledge-based, affect incremental and breakthrough innovation capabilities, and ultimately new product performance. Grounded in the customer-driven innovation model and dynamic capabilities theory, the research adopts a quantitative approach using survey data from Malaysian firms engaged in new product development. The results reveal that functional and emotional customer participation significantly enhance both types of innovation capabilities, whereas knowledge-based participation shows no direct influence. Moreover, neither incremental nor breakthrough innovation capabilities exhibit a direct effect on product performance, highlighting the critical role of effective commercialization strategies in transforming innovation into tangible results. These findings advance theoretical understanding by unpacking the differentiated effects of customer engagement on innovation outcomes and offer actionable insights for firms seeking to optimize customer co-creation and innovation pathways.

Keywords:
Customer participation; Innovation capabilities; New product performance; Product development; Product innovation.

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1. Introduction

In today's dynamic market environment, new product development (NPD) is an important means for enterprises to respond to market needs and a key capability for enterprises to maintain growth and competitiveness (Mota et al., 2024; Nguyen et al., 2024). The NPD process has shifted from the traditional one centred on internal R&D to one centred on customers, and companies are paying more attention to customer opinions to meet the changing market demands (Nugroho, 2025). Firms increasingly empower customers to participate in product design and development, which has significant behavioural and psychological impacts and is critical for innovation and market success (Maier & Baccarella, 2024). By enhancing customer participation, existing needs can be met, business operations improved, and new market opportunities created (Yustian,2025). By incorporating customer contributions regarding functional feedback, emotional support, and expertise, companies can improve their product innovation and market fit.

Customer participation manifests in multifaceted ways, each yielding distinct impacts on NPD outcomes, including functional participation, emotional engagement, and knowledge-based collaboration. Functional participation, such as prototype testing and feedback collection, drives

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sustainable and scalable product innovation (Yuk et al., 2025). Emotional engagement during the development phase helps customers establish an emotional connection with the eventual products, increasing the likelihood of market success (Rashid, 2024). Knowledge-based collaboration, in which customers contribute specialised expertise or strategic advice, produces innovative solutions that improve service performance and develop new products (Parwati & Martini, 2024). These interactions collectively enhance process innovation and market competitiveness.

Innovation capabilities play a key role in promoting new product development. Breakthrough innovations, characterised by disruptive product creation, directly enhance product market fit and revenue growth (Ren, 2023). Incremental innovation involves gradual improvements to existing products, allowing firms to make steady progress without the uncertainty accompanying radical changes (Zhou et al., 2023b). However, prior research (Anning-Dorson, 2026; Feng & Liu, 2024) frequently conceptualises innovation as a secondary outcome of customer collaboration rather than a direct driver of performance. This study addresses this gap by examining how customer participation affects breakthroughs and incremental innovations and how innovation capabilities determine new product performance. Hence, this study addresses the following research questions: (i) Does customer participation (functional, emotional, and knowledge-based) influence new product performance? (ii) Does customer participation influence innovation capabilities (breakthrough and incremental)? (iii) Do innovation capabilities (breakthrough and incremental) influence new product performance?

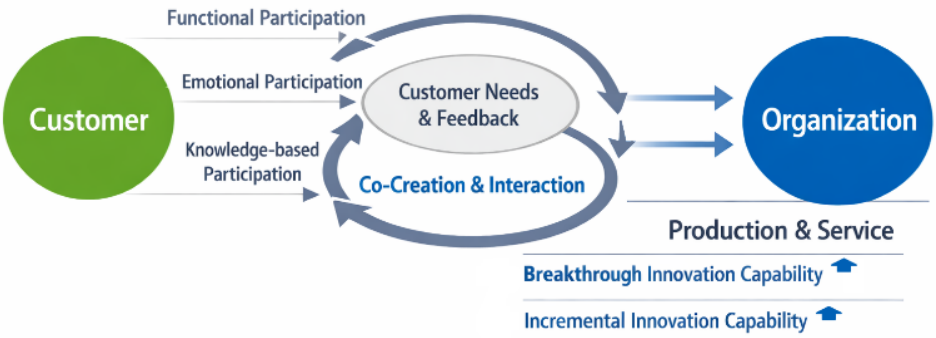
The remainder of this paper is organised as follows: Section 2 reviews relevant literature and theoretical frameworks. Section 3 details the research methodology, including data collection and analysis methods. Section 4 presents the empirical results and hypothesis testing. Section 5 concludes with conclusion, implications, limitations, and directions for future research.

2. Literature review

This section synthesises existing theories and empirical findings to establish the relationships among customer participation, innovation capabilities, and new product performance. Building on the Customer-Driven Innovation Model and Dynamic Capabilities Theory, this section clarifies how functional, emotional, and knowledge-based customer participation to shape breakthrough and incremental innovation, together with innovation capabilities, determines product success. Veerappan and Pradeesh (2023) has underscored the importance of customer participation as a driver of innovation, and the role of integrating internal and external capabilities in enhancing firm performance (Yan et al., 2025). There are two theories related to this study, namely, Customer-Driven Innovation Model and Dynamic Capabilities Theory.

2.1 Customer-driven innovation model

The Customer-Driven Innovation Model (CDIM) was originally proposed by Desouza et al. (2008) to describe the incorporation of customer input into organisational innovation processes. As supporters and executors, companies ensure that customers' ideas can be transformed into actual products and services by incorporating customers preferences and needs into product design and innovation strategies (Desouza et al., 2008). Figure 1 shows the interactive relationship between the organisation and the customer.



(Source: Author self-developed)

Figure 1: Dynamic Capabilities in New Product Performance

Organisations that adopt co-creation strategies can leverage the diverse perspectives and experiences of their customer bases to improve their innovation performance (Veerappan & Pradeesh, 2023). To achieve this goal, it is necessary to focus on the diversity of customer innovation and adjust the organizational mission and structure to adapt to new requirements. Customers communicate their product requirements to firms through various interactions, and firms translate these requirements into practical product functions (Liu et al., 2024). The rise of customer-driven innovation has spawned a variety of methods, with deep customer participation in new product development as the core, effectively promoting the optimisation and practice of innovation models.

2.2 Dynamic capabilities theory

Dynamic Capability Theory (DCT) proposes that organisations can gain a competitive advantage through their ability to integrate, build, and reconfigure internal and external capabilities (Bari et al., 2024). The theory is constructed using firm resources, strategy, and external resource providers (Teece, 2018), which constitute the foundational conditions for capability transformation. Through these processes, organisations can support the effective deployment of innovation capabilities. This facilitates their transformation into new product performance. Figure 2 illustrates the dynamic capabilities of new product performance.

(Source: Author self-developed)

Figure 2: Dynamic Capabilities Theory in New Product Performance

Enterprises that draw on dynamic capability processes can enhance their innovation potential and market responsiveness, enabling them to cope better with economic fluctuations and technological advances (Yan et al., 2025). Adopting dynamic capabilities that are suitable for the enterprise itself, such as learning, integration, and coordination, will significantly affect sustainable innovation performance, combining exploration and exploitation to achieve product results (Sari et al., 2024). This process of continuous learning and adaptation can enhance customer engagement, promote the development of organizational innovation capabilities, and optimise product performance. In this study, these dynamic capability processes provide a theoretical perspective for clarifying the role of innovation capabilities in shaping new product performance.

2.3 Research framework and hypotheses

As shown in Figure 3, this study is based on the customer-driven innovation model (CDIM) and dynamic capabilities theory (DCT) to explore how different dimensions of customer participation affect a company's breakthrough and incremental innovation capabilities and ultimately improve new product performance.

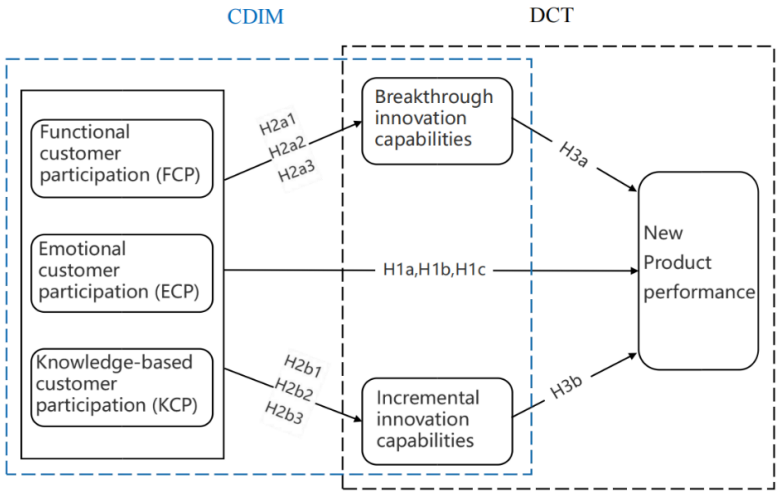


Figure 3: Research framework

2.3.1 Customer participation and new product performance

Different types of customer participation may have different impacts on new product development results (Zhang et al., 2023). Collaborative product design with consumers can optimise product functions and make them closer to consumers' actual needs (Hazell et al., 2024). As companies prioritise consumer-led insights during the development process, they can translate these insights into more polished and successful products (Maier & Baccarella, 2024). Customer participation in product design and functional feedback can significantly improve the structural performance of a product. Companies can improve product performance by encouraging consumers to provide valuable functional insights (Woodward, 2023).

Emotional engagement during the development phase helps customers establish an emotional connection with future finished products, increasing the likelihood of market success (Rashid, 2024). In addition, emotional engagement can influence consumer purchasing behaviour by shaping their product perception (Agarwal, 2023). Customer engagement based on emotional connection can foster long-term loyalty, as satisfied customers tend to return and support the brand’s products, thereby expanding its popularity in the market (Sondari, 2025).

Organisations that simultaneously leverage knowledge gained from customers perform better than those that rely solely on internal knowledge frameworks, especially in sales growth and new product development (Zahari et al., 2023). In addition, performance and adaptability in rapidly evolving product and service markets can be improved by restructuring internal organizational processes and integrating new external insights (Kurniawan et al., 2024). In the co-creation process, creating an atmosphere conducive to knowledge exchange can maximise the potential utility of customer knowledge (Ankrah et al., 2024). Innovation strategies developed using multidisciplinary knowledge can produce superior results in understanding complex systems and their applications (Harrington, 2025). Based on the findings above, the following hypothesis was developed:

H1a: There is a positive relationship between functional customer participation (FCP) and new product performance.
H1b: There is a positive relationship between emotional customer participation (ECP) and new product performance.
H1c: There is a positive relationship between knowledge-based customer participation (KCP) and new product performance.

2.3.2 Customer participation and innovation capabilities

Customer involvement in problem-solving and decision-making can influence the innovativeness of new products, and different types of co-development can produce different interactions (Dean et al., 2024). Fan et al. (2023) emphasised that innovative breakthroughs often hinge on learning from customers, as their perspectives can inform novel ways of developing products and services (Fan et al., 2023). Customers provide feedback and suggestions to help improve products and services through product and service testing, which is more likely to lead to breakthrough innovations for the organisation (Binsaeed et al., 2023). In addition, Zhou et al. (2023a) demonstrated that companies can use emotion-related perception data provided by consumers to guide their innovation strategies in product design. Firms collaborate with outsiders to actively seek valuable new knowledge and help achieve breakthrough innovation (Ma & Wu, 2024).

An open innovation environment with customer participation can encourage organisations to generate new ideas and solutions, thereby gradually promoting the innovation process within the organisation (Yusof & Rahim, 2024). Through deep interaction, FCP and ECP can enhance a company's understanding of customer functional feedback and emotional needs, which helps companies achieve better performance in incremental innovation. In addition, by introducing external knowledge, organisation can be promoted (Audretsch et al., 2024). Based on the findings above, the following hypotheses were proposed:

H2a1: There is a positive relationship between functional customer participation and breakthrough innovation capabilities.
H2a2: There is a positive relationship between emotional customer participation and breakthrough innovation capabilities.
H2a3: There is a positive relationship between knowledge-based customer participation and breakthrough innovation capabilities.
H2b1: There is a positive relationship between functional customer participation and incremental innovation capabilities.
H2b2: There is a positive relationship between emotional customer participation and incremental innovation capabilities.
H2b3: There is a positive relationship between knowledge-based customer participation and incremental innovation capabilities.

2.3.3 Innovation capabilities and new product performance

Strong innovation capabilities can lead to stronger market performance and sustained product competitive advantage (Fasanmi et al., 2025). Among them, breakthrough innovation often represents substantial progress and can significantly improve product market results of products (Cheng & Song, 2024). Simultaneously, breakthrough innovation can guide future market directions and help companies establish a stable competitive advantage (Ma & Wu, 2024).

Incremental innovation usually involves adjustments and improvements to existing products, and its risk is relatively low compared to that of radical innovation (Mayr et al., 2024). Incremental innovation helps companies stay competitive in highly competitive and saturated markets by improving their product features and enhancing usability (Blank, 2024). Incremental innovation can not only improve product energy efficiency but also enhance operational efficiency and extend the product life cycle by optimising existing products (Bag et al., 2025). Based on the findings above, the following hypotheses were developed:

H3a: There is a positive relationship between breakthrough innovation capabilities and new product performance.

H3b: There is a positive relationship between incremental innovation capabilities and new product performance.

3. Research methods

This study used a quantitative survey method to determine the relationship between variables. It aims to understand a specific population or sample by collecting specific data for quantitative analysis (Azhar et al., 2024). The subjects of this study are organizational representatives of companies in Malaysia who have experience in new product development in the past three years. The study used the *F* test in *G**Power to estimate the required sample size, adjusted the number of models to five non-dependent variables and one group, and specified the number of effects, significance level, and power settings to be 0.15, 0.05, and 0.9, respectively. Data analysis showed that the minimum sample size required for this study was 116 participants.

3.1 Data collection procedure

Data were collected through an online survey using a structured, anonymous questionnaire. The survey did not require registration to simplify the response process and encourage candid responses while ensuring data completeness and reliability. Official email accounts are often managed by administrative staff or restricted by information technology policies, which can hinder direct access to target respondents and lead to non-response bias (Seliniotaki et al., 2024). In contrast, informal digital channels, such as social media platforms, could help disseminate complex information and increase the accessibility of research communication and respondents' willingness to engage (Hassan et al., 2024). Therefore, the study mainly relied on online communities such as Facebook and instant messaging platforms such as WhatsApp to effectively reach potential respondents.

3.2 Questionnaire design and measurement

The main body of the research model includes customer participation in NPD, enterprise innovation capabilities, and new product performance (NPP). Customer participation types include FCP, ECP, and KCP. Enterprise innovation capabilities include breakthrough innovation capabilities (BIC) and incremental innovation capabilities (IIC). The questionnaire contained 25 measurement items, all of which have been validated and appropriately adjusted in previous studies. The customer participation measurement design had 12 items, adapted from Chen and Liu (2019). Innovation capabilities had nine items, adapted from the studies of Gui et al. (2022)

and Al-Khatib et al. (2022). New product performance has four items, adapted from Adomako et al. (2024) and Tjahjadi et al. (2020). Please refer to the Appendix for details on the questionnaire items.

This study primarily used a five-point Likert scale for measurements. The design of the five-point Likert scale allows for a structured and detailed measurement of attitudes and feelings and has shown good reliability and validity in surveys (Wang et al., 2025). However, research shows that when variables are measured using the same scale, the likelihood of central tendency bias increases (Prayogo, 2024). To mitigate the potential risk of common method bias, innovation capability items were measured using a seven-point Likert scale to enhance response variability (Dawes, 2008; Podsakoff et al., 2003). Data screening and analysis were conducted using SPSS27 and SmartPLS3.2.9.

4. Data analysis and results

At the end of the data collection period, 203 questionnaires were collected. The online questionnaire design of this study required all options to be filled in before submission; therefore, there were no questionnaires with missing data. After excluding responses from organisations that either (1) had not engaged in any new product development in the past three years or (2) had developed new products without customer participation, 174 valid responses remained. This was greater than the minimum sample size of 116 required for this study, as determined by G*Power analysis. Scores with Z values below -3.29 or above 3.29 on the standardised scale were considered outliers (Lemire, 2024). As shown in Table 1, this study used SPSS27 to check the limits of z and found no outliers, indicating that all 174 responses were suitable for data analysis.

Checking the skewness and kurtosis values is important to understand the normal distribution of the dataset; values within ±2 can indicate that the dataset is relatively normally distributed (Üzülmez, 2024). Based on this rule, no outliers were found, indicating that the dataset was relatively normally distributed.

Table 1: Results of data screening

		Z-Score			
Variable	Item	Lower	Upper	Skewness	Kurtosis
Functional customer participation	FCP1	-2.36096	1.02714	-0.67	-0.58
	FCP2	-2.54584	1.28117	-1.034	0.35
	FCP3	-2.27962	1.08186	-0.91	0.31
	FCP4	-2.29980	1.12774	-0.82	-0.27
Emotional customer participation	ECP1	-2.42552	1.22851	-0.59	-0.34
	ECP2	-2.83488	1.10340	-0.73	0.02
	ECP3	-2.68860	1.53548	-0.34	-0.12
	ECP4	-2.55401	0.91108	-1.13	0.54
Knowledge-based customer participation	KCP1	-1.85860	1.63129	-0.28	-0.53
	KCP2	-2.06038	1.20619	-0.26	-1.12
	KCP3	-2.81578	1.49144	-1.04	1.18
	KCP4	-2.22420	1.43547	-0.74	-0.19
Breakthrough innovation capabilities	BIC1	-2.70213	1.52729	-0.50	-0.25
	BIC2	-1.94602	1.44006	-0.18	-1.19
	BIC3	-2.21449	1.63103	-0.33	-0.68
	BIC4	-2.43112	1.37983	-0.35	-0.56
	BIC5	-2.02057	1.54515	-0.49	-0.69
Incremental innovation capabilities	IIC1	-2.51542	1.62147	-0.24	-0.50
	IIC2	-2.10811	1.34586	-0.51	-0.59
	IIC3	-2.68070	1.47160	-0.73	0.43
	IIC4	-2.26784	1.63913	-0.54	-0.72
New product performance	NPP1	-2.62912	1.41032	-1.19	0.94
	NPP2	-2.55570	1.26140	-0.63	-0.02
	NPP3	-2.65955	1.39088	-0.98	0.65
	NPP4	-2.93896	1.17677	-0.93	0.75

4.1 Descriptive statistics

The demographic data of the 174 respondents with valid data are presented in Table 2. First, the filtered categories show that 174 respondents' organisations have had customer-involved new product development in the past three years. Most (44.8%) of the respondents' organisations had been in operation for 4–8 years, followed by 0–3 years (25.3%), 9–15 years (16.7%), and more than 15 years (13.2%). Most respondents' organisations have 101–500 employees (36.8%) and less than 20 (35.1%), followed by more than 500 (14.9%) and 20-100 (13.2%).

The analysis then turned to the users' personal situation within the organisation. Most of the users worked in the marketing department within the organisation (44.8%), followed by production (20.1%), research and development (18.4%), procurement (9.8%), and other (5.2%). Most respondents were frontline employees (46.6%), followed by frontline management (21.8%), middle management (14.9%), senior management (12.1%), and others (4.6%).

Table 2: Respondents' profile

Demographic Data	Frequency	Percentage
Years of operation:		
0–3 years	44	25.3%
4–8 years	78	44.8%
9–15 years	29	16.7%
More than 15 years	23	13.2%
Number of employees:		
Less than 20	61	35.1%
21–100	23	13.2%
101–500	64	36.8%
More than 500	26	14.9%
Department:		
Research & Development	32	18.4%
Marketing	81	46.6%
Production	35	20.1%
Procurement	17	9.8%
Other	9	5.2%
Position		
Senior management	20	12.1%
Middle management	26	14.9%
Frontline management	38	21.8%
Frontline employee	81	46.6%
Other	8	4.6%

4.2 Reliability and validity analysis

The reliability and validity evaluation of the questionnaire relies on three important criteria: internal consistency reliability, convergent validity, and discriminant validity (Li, 2024). Cronbach's α was used to assess the internal consistency reliability of the constructs, and a threshold of 0.70 is usually considered appropriate (Monazah, 2024). As shown in Table 3, after measurement, the Cronbach's α of all variables in this study was greater than 0.7, so it can be considered that the questionnaire used in this study has a high reliability.

Outer loadings reflect the strength of the relationship between the measurement items and the corresponding items. The common threshold of acceptable external loading is 0.70, which proves that the measurement item has sufficient explanatory power for the latent variable. If the value is lower than 0.5, it needs to be considered for deletion (Ribeiro, 2024). As shown in Table 3, the external loading values of most measurement items in this study are higher than 0.7, indicating that they have strong convergent validity. However, the external loading values of some measurement items are lower than the recommended values (such as BIC1 = 0.696, ECP1 = 0.666, ECP3 = 0.580). For these items, their theoretical support and the impact on validity indicators (AVE and CR) are further analysed.

Table 3: Construct reliability

			Reliability statistics after item deletion			
Construct	Item	loading	Cronbach's α	rho_A	Composite Reliability	AVE
Breakthrough innovation capabilities (BIC)	BIC1	0.696	0.857	0.866	0.898	0.640
	BIC2	0.765				
	BIC3	0.803				
	BIC4	0.841				
	BIC5	0.882				
Emotional customer participation (ECP)	ECP1	0.666	0.720	0.772	0.843	0.645
	ECP2	0.885				
	ECP3	0.580				
	ECP4	0.782				
Functional customer participation (FCP)	FCP1	0.762	0.814	0.824	0.878	0.643
	FCP2	0.783				
	FCP3	0.780				
	FCP4	0.878				
Incremental innovation capabilities (IIC)	IIC1	0.809	0.788	0.789	0.863	0.612
	IIC2	0.773				
	IIC3	0.766				
	IIC4	0.779				
Knowledge-based customer participation (KCP)	KCP1	0.693	0.782	0.796	0.860	0.609
	KCP2	0.832				
	KCP3	0.703				
	KCP4	0.877				
New product performance (NPP)	NPP1	0.801	0.805	0.815	0.873	0.634
	NPP2	0.700				
	NPP3	0.863				
	NPP4	0.812				

The standardised factor loadings should exceed 0.5, and the construct reliability (CR) should be above 0.7 for the model to be deemed valid (Açar, 2024). In the initial model, the AVE of the ECP latent variable was 0.544, close to the minimum standard (0.5), indicating that its convergent validity must be improved. After deletion of ECP3, the AVE of ECP increased to 0.645, and the CR increased to 0.843, which was significantly better than the previous data. This shows that deleting this low-loading measurement item positively affected convergent validity. As shown in Table 3, after removing the low loadings, the latent variables all met the recommended value standards (CR ≥ 0.7, AVE ≥ 0.5), indicating that the latent variables have good convergent validity for their measurement items and that the measurement items can be effectively aggregated under their respective latent variables.

The Fornell-Larcker criterion can be used to assess discriminant validity in structural equation models (Rai et al., 2024). As shown in Table 4, most of the cases in this study met the Fornell-Larcker criteria, which is greater than its correlation coefficient with all other constructs (e.g. the correlation coefficient between BIC and ECP is 0.751). However, the correlation coefficient between ECP and FCP is 0.841, which is slightly higher than the AVE square root of ECP of 0.803, indicating that there may be some overlap between the two constructs. Theoretically, ECP and FCP may be closely related in the actual context of customer participation. For example, when customers provide functional suggestions, they may be accompanied by positive emotional reactions. As a result, the discriminant validity of the measurement model is good, and the result is acceptable for the slight overlap between ECP and FCP through theoretical rationality.

Table 4: Fornell-Larcker criterion

		Correlation				
	Sqrt AVE	BIC	ECP	FCP	IIC	KCP
BIC	0.800					
ECP	0.803	0.751				
FCP	0.802	0.773	0.841			
IIC	0.782	0.904	0.830	0.800		
KCP	0.780	0.628	0.706	0.802	0.662	
NPP	0.796	0.782	0.866	0.887	0.821	0.711

4.3 Structural model assessment

This study used SmartPLS to construct a structural equation model and conduct the evaluation. R^2 is used to assess the explanatory power of latent variables; $R^2 \geq 0.75$ indicates strong explanatory power, values between 0.50 and 0.75 are considered moderate, and values between 0.25 and 0.50 are classified as weak explanatory power (Arrozak, 2024). The R^2 values in this study are shown in Figure 4. Breakthrough innovation capabilities (BIC): $R^2 = 0.632$, indicating that the customer participation variable can explain 63.2% of the variation in BIC, indicating a moderate level of explanatory power. Incremental innovation capabilities (IIC): $R^2 = 0.725$, indicating that 72.5% of the variation in IIC can be explained, indicating strong explanatory power. New product performance (NPP): $R^2 = 0.846$, indicating that the predictor variable can explain 84.6% of the variation in NPP, demonstrating a very strong explanatory power.

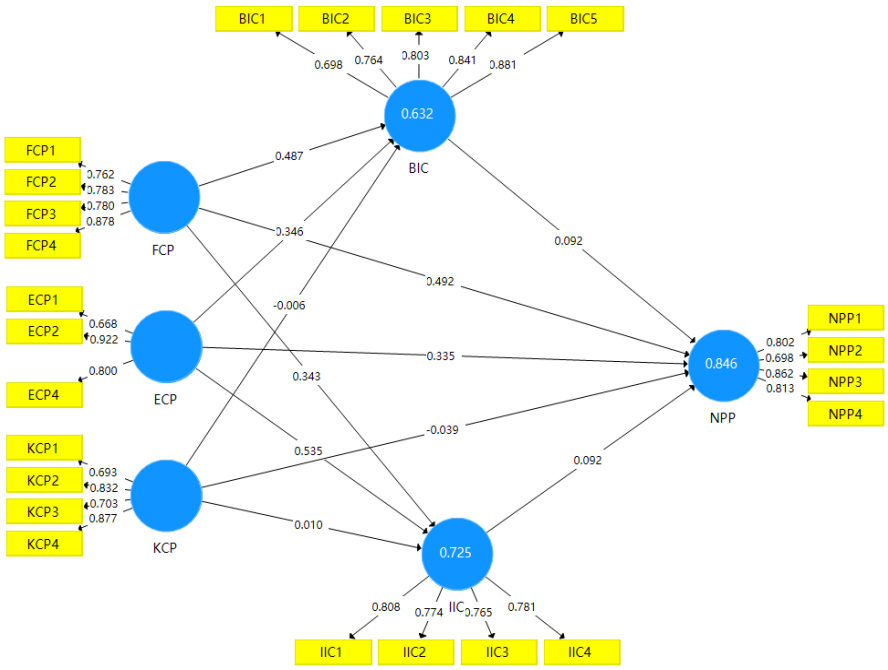


Figure 4: Structural Model

The f^2 results of this study are presented in Table 5. According to Cohen (1988), f^2 values of 0.02, 0.15, and 0.35 were interpreted as small, medium, and large effect sizes, respectively (Bazelais et al., 2024). Based on this, the medium effects were isolated as ECP→IIC (0.302), ECP→NPP (0.160), and FCP→NPP (0.286). Small effects were observed for BIC→NPP (0.010) and FCP→ECP (0.133). The KCP showed a lower effect size. Among them, the ECP and FCP made significant contributions. ECP demonstrated a medium-to-high impact on IIC, with an f^2 value of 0.302. Additionally, ECP

exerted a moderate effect on NPP, with an f^2 value of 0.160. FCP notably impacted NPP, with an f^2 value of 0.286, indicating a substantial contribution.

Table 5: Model assessment

	f^2 statistics					
	BIC	ECP	FCP	IIC	KCP	NPP
BIC	-	-	-	-	-	0.010
ECP	0.094	-	-	0.302	-	0.160
FCP	0.133	-	-	0.088	-	0.286
IIC	-	-	-	-	-	0.007
KCP	0.000	-	-	0.000	-	0.003
Q^2 value	0.384				0.431	0.522

Q^2 greater than 0, 0.25, and 0.50 indicates small, medium, and large prediction relevance, respectively (Khan & Hinterhuber, 2024). As shown in Table 5, the Q^2 of all latent variables are greater than 0.35, indicating that the model has a strong predictive relevance for latent variables. Among them, NPP had Q^2=0.522, showing the highest predictive relevance, followed by IIC (Q^2=0.431) and BIC (Q^2=0.384). This shows that the constructed model can explain and predict changes in the latent variables.

Table 6 summarises the results of the hypothesis testing. Based on the *p*-values, hypotheses H1a, H1b, H2a1, H2a2, H2b1, and H2b2 were supported. The remaining hypotheses were not supported.

Table 6: Hypothesis testing results

Hypothesis	Relationship	*p*-value	Decision
H1a	FCP → NPP	<0.001	Supported
H1b	ECP → NPP	<0.001	Supported
H1c	KCP → NPP	0.406	Not Supported
H2a1	FCP → BIC	<0.001	Supported
H2a2	ECP → BIC	<0.001	Supported
H2a3	KCP → BIC	0.958	Not Supported
H2b1	FCP → IIC	0.001	Supported
H2b2	ECP → IIC	<0.001	Supported
H2b3	KCP → IIC	0.895	Not Supported
H3a	BIC → NPP	0.198	Not Supported
H3b	IIC → NPP	0.303	Not Supported

5. Discussion and conclusion

Based on the analytical results of the 174 samples measured, this study aimed to answer three main questions. The first research question posed was, " Does customer participation (functional, emotional, and knowledge-based) influence new product performance?" Based on Hypothesis 1, the results of this study showed that functional customer participation (FCP) has a significant positive impact on new product performance, which is consistent with prior research showing that customer contribution to functional aspects such as product usability and technical specifications help enhance new product outcomes (Zaefarian et al., 2024). Similarly, the significant positive correlation between emotional customer engagement (ECP) and new product performance also confirms that customer emotional engagement can improve user product acceptance (Gan et al., 2021). Customer knowledge has enormous value in improving innovation outcomes (Mihailovic, 2024). However, in this study, the data analysis of knowledge-based customer participation (KCP) on new product performance did not show a significant impact.

This finding overturned the initial hypothesis. The possible explanation for this is that customer knowledge was not effectively integrated into the product development process during customer participation, resulting in a lack of significant participation effects. This suggests that organisations may need to establish stronger mechanisms to obtain and utilise customer expertise to ensure its effective application in product development.

The second research question was, "Does customer participation influence on the innovation capabilities (breakthrough and incremental)?" The finding that both functional and emotional customer participation positively impacted breakthrough and incremental innovation capability supported hypothesis 2. As Phi (2024) points out, knowledge from customers is a knowledge resource that can help companies conduct operations and innovate (Phi, 2024). Similarly, by actively engaging with customer reviews and emotions, organisations can identify specific features that need to be modified or enhanced, thereby driving continuous product improvement (Mboungou, 2024). In contrast, knowledge-based customer participation did not show a significant relationship with breakthrough and incremental innovation capabilities, which may be due to the difficulty of translating customer knowledge into actionable innovation strategies. This further indicates that organisations need to better manage and utilise customer knowledge to improve their innovation capabilities.

The third research question of the current study was, " Does innovation capabilities (breakthrough and incremental) influence new product performance?" Although it is theoretically believed that companies actively implementing innovative solutions gain more significant advantages than their competitors, that is, competitive advantage can be driven by innovation capabilities (Kubitskyi, 2024). However, according to the results of Hypothesis 3, neither breakthrough innovation capabilities nor incremental innovation capabilities showed a significant direct impact on new product performance. One possible explanation is that there is a time lag between developing innovation capabilities and achieving their market impact, especially in resource-constrained environments, such as Malaysia. In addition, the commercialisation process and market acceptance of innovation results may play a more important role than pure innovation capability.

In summary, the results show that functional and emotional customer participation significantly improve new product performance, whereas knowledge-based customer participation does not show a significant direct impact. In addition, although functional and emotional customer participation positively impact both breakthrough and incremental innovation capabilities, innovation capabilities fail to directly and significantly improve new product performance. These results suggest that companies must more effectively combine customer knowledge and innovation capabilities with market-oriented strategies to realise the commercial value of innovation.

5.1 Implications

This study advances the theoretical understanding of customer participation, innovation capabilities, and new product performance. By integrating the Customer-Driven Innovation Model with Dynamic Capabilities Theory, this study extends the existing literature on customer participation in new product development. Unlike prior studies that treat customer participation as a monolithic construct, this study disaggregates it into functional (FCP), emotional (ECP), and knowledge-based (KCP) dimensions, revealing their differential impacts on new product performance. Specifically, FCP and ECP positively influenced performance, underscoring the strategic value of customer feedback and emotional involvement in demand forecasting, product adaptation, and production flexibility. In contrast, KCP did not have a significant effect, suggesting potential inefficiencies in firms' ability to absorb and leverage customer expertise, highlighting the need for improved knowledge integration mechanisms.

Furthermore, this study contributes to the innovation capability literature by examining how different modes of customer participation shape both breakthrough (BIC) and incremental innovation capabilities (IIC). The findings demonstrate that FCP and ECP positively impact both innovation types, emphasising the value of co-creation in generating context-relevant solutions to complex problems. However, contrary to expectations, innovation capabilities do not directly translate into enhanced new product performance. This divergence suggests that their impact may be mediated through mechanisms such as commercialisation processes or strategic resource allocation, thereby offering a nuanced extension of Dynamic Capabilities Theory.

This study also provides empirical insights into customer knowledge management (CKM). The non-significant effects of KCP on innovation and performance indicate the critical role of knowledge transformation processes. Without effective organizational mechanisms for knowledge capture, analysis, and application, the potential of customer expertise remains under-utilised. This underscores the imperative for systematic customer knowledge management practices to fully realise innovation and competitive advantages.

Moreover, this study offers several practical implications for managers aiming to enhance new product performance via customer participation. First, the findings indicate that functional and emotional customer participation significantly drives the product outcomes. Therefore, firms should develop interactive mechanisms to capture customer feedback and foster emotional investment. Leveraging customer management systems and social platforms can facilitate the real-time monitoring of user preferences and product evaluations, enabling more targeted marketing and service adaptation. Emotional engagement can also be enhanced through thematic online campaigns and offline events, which strengthen customer satisfaction and amplify brand influence through word-of-mouth.

Second, although knowledge-based customer participation has a limited direct impact on innovation and product performance, systematic customer knowledge management remains essential. Firms should implement structured processes to capture, transform, and apply customer expertise in product development and strategic planning. Employee involvement in knowledge integration is equally vital; exposing staff to customer insights can inspire innovation and refine service delivery, reinforcing a feedback-driven innovation loop.

Third, the absence of a direct link between innovation capability and product performance suggests the need to align innovation with commercialisation strategies. Organisations should accelerate the market translation of innovations through cross-functional collaboration. For example, breakthrough innovations can be piloted in regional markets with higher shares, refined through customer feedback, and then scaled up. In resource-constrained settings, incremental innovation pilots offer a low-risk approach for validating concepts and managing uncertainty.

Finally, the results emphasise the synergy between customer participation and organizational culture. A customer-centric culture not only enhances employee receptivity to customer input but also boosts job satisfaction and innovation. Recognising staff contributions to customer engagement and promoting success stories can further embed a participatory ethos across the organisation.

5.2 Limitations

First, this study is limited by its geographical focus on Malaysian firms, which may constrain the generalisability of the findings owing to Malaysia's unique economic and cultural context influencing customer participation and innovation dynamics. To enhance external validity, future studies should consider cross-national comparisons, particularly within Southeast Asia, to examine regional variations in the applicability of the model and cultural influences.

Second, reliance on cross-sectional data restricts the ability to capture temporal effects and infer causal relationships between customer participation, innovation capabilities, and new product performance. Future research should adopt longitudinal designs to trace these relationships over time, offering insights into co-creation efforts and their influence on performance across the different stages of product development.

Third, while this study reveals that knowledge-based customer participation does not significantly influence innovation capability or product outcomes, it does not investigate the underlying mechanisms or contextual moderators. Future work could explore mediating and moderating variables, such as internal knowledge management systems, market competition intensity, and product launch frequency, to uncover why customer knowledge sometimes fails to translate into tangible innovation benefits.

Finally, data were collected through an anonymous online survey disseminated on social media platforms. Consequently, it was not possible to completely rule out the possibility of multiple respondents originating from the same organisation. While this approach enhanced accessibility and participation, future research could adopt more controlled sampling approaches, such as using organisational registries or verified corporate email invitations, to strengthen representativeness at the organisational level and ensure greater sampling precision.

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Data access statement: The data supporting the findings of this study are available from the first author upon reasonable requests.

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Appendix: Questionnaire items

Terms	Definition
New products	Encompass newly launched products and services, as well as improved or upgraded versions of existing offerings introduced to the market. Any product not previously sold qualifies as a 'new product'.
Customer participation	Refers to any form of customer interaction during the new product development process.

Section A: Respondent demographic profile and company information

1. Has your organization developed new products within the past three years?
   ( ) Yes ( ) No (If selected, please end the survey here.)
2. Was customer participation involved in the new product development process?
   ( ) Yes ( ) No (If selected, please end the survey here.)
3. Was customer participation involved in the new product development process?
   ( ) Yes ( ) No (If selected, please end the survey here.)
4. Year of Operation:
   ( ) 0–3 years ( ) 4–8 years ( ) 9–15 years ( ) More than 15 years
5. Number of employees:
   ( ) Less than 20 ( ) 21–100 ( ) 101–500 ( ) More than 500
6. Department:
   ( ) Research & Development ( ) Marketing ( ) Production ( ) Procurement ( ) Other (please specify): _____
7. Your management level:
   ( ) Senior management ( ) Middle management ( ) Frontline management ( ) Frontline employee ( ) Other (please specify): _____

Section B:

Functional customer participation (FCP)
1. During the development of new products, we often collect functional suggestions from customers.
2. In the later stage of new product development, we will test features with customers and ask for feedback.
3. The feedback and suggestions provided by customers during the function design of product have a great influence on our decision-making.
4. We believe that functional feedback and suggestions from customers represent a critical consideration in the development of new products.

Emotional customer participation (ECP)
1. Customers' emotional reactions (such as brand loyalty, design preferences) have a great influence on our new product development decisions.
2. We believe that customers' emotional feedback has an important impact on the success of emotional factors such as new product appearance and brand image
3. In our company, customers' emotional feedback is considered fully in design of a new product.
4. In the development process of new products, we will make adjustments based on customers' emotional feedback, meeting the preferences of the broadest group.

Knowledge-based customer participation (KCP)
1. We encourage customers to make professional suggestions on technology development and functional design.
2. We often invite customers with professional backgrounds to provide evaluations and suggestions for technology, functions of a new design and so on.
3. We believe that the technical or professional knowledge provided by customers is of great value in new product innovation.

4. In our company, technical feedback provided by customers is regarded as an important basis for decision-making.

Breakthrough innovation capabilities
1. Our company focuses on creativity and invention.
2. Our company has the ability to take advantage of new opportunities in new markets.
3. Our company accepts customer needs beyond existing products and services and has the innovation ability to meet the needs
4. Our company has the innovation ability to change fundamentally existing products.
5. Our company has the innovation ability to commercialize new products and services.

Incremental innovation capabilities
1. Our company has the innovation ability to strengthen existing production lines.
2. Our company regularly makes small adjustments to existing products and services.
3. Our company has the ability to optimize continuously products and services for existing markets.
4. Our company has the innovation ability to optimize continuously product delivery efficiency.

New product performance
1. The profitability of this product is higher than that of other competing products.
2. The market evaluation feedback of this product is higher than that of other competing products.
3. The growth rate of market share of this product is higher than that of other competitive products.
4. The return on investment of this product exceeds the company's expected target.