



How Customer Participation Drives Continuance Intention in Fresh Food E-Commerce: The Mediating Role of Perceived Service Quality and the Moderating Role of Technology Anxiety

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Abstract: This article develops and tests a mechanism-based model of continuance intention in fresh food e-commerce. The model positions customer participation as a multidimensional antecedent, perceived service quality as the mediating mechanism, and technology anxiety as a moderating boundary condition. The study is situated in Guangdong Province, China, where fresh food e-commerce is highly competitive, logistics intensive, and closely linked to repeated household purchasing. Drawing on a process-oriented perspective, the analysis distinguishes four dimensions of customer participation: task cognition, information seeking, effort expenditure, and human-computer interaction. These dimensions are hypothesised to influence continuance intention directly and indirectly through perceived service quality. Technology anxiety is further expected to weaken the positive relationship between participation and perceived service quality, particularly in those pathways that depend on digital information processing. A structured questionnaire was administered to fresh food e-commerce users, and 550 valid responses were analysed using Partial Least Squares Structural Equation Modelling. The measurement model demonstrated acceptable reliability and validity. Structural results show that all four participation dimensions positively influence perceived service quality. Effort expenditure exerts the strongest effect, followed by information seeking and human-computer interaction. Perceived service quality, in turn, positively influences continuance intention, indicating a meaningful mediating role. The direct effects of customer participation on continuance intention remain significant, which suggests partial rather than full mediation. Technology anxiety has a significant direct negative effect on perceived service quality and significantly weakens only the information-seeking pathway. Its moderating effects on task cognition, effort expenditure, and human-computer interaction are not statistically significant. The findings indicate that customer participation in fresh food e-commerce is both valuable and internally differentiated. The results also show that digital psychological constraints do not undermine all participation forms equally. The article extends current work on digital retail continuance by showing that users remain with fresh food e-commerce platforms not simply because the service is convenient, but because their own participation is successfully converted into favourable evaluations of service quality. For practice, the results suggest that platforms should prioritise interface clarity, information transparency, fulfilment reliability, and low-friction support for technology-anxious users rather than merely increasing participation volume.

Keywords: Customer Participation; Perceived Service Quality; Continuance Intention; Technology Anxiety; Fresh Food E-Commerce; Guangdong

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1. Introduction

China's fresh food e-commerce market has moved from an experimental niche to a mainstream retail infrastructure. What began as an efficiency-driven digital response to consumers' demand for convenience now operates as a complex service ecosystem in which product quality, delivery reliability, information transparency, and interface usability jointly shape repeat purchasing. This evolution has important theoretical implications. In fresh food e-commerce, continuance intention cannot be reduced to a generic post-adoption attitude, because the service is experienced under unusually high operational pressure: products are perishable, fulfilment is time-sensitive, product inspection is delayed until after delivery, and service failures are immediately consequential for household consumption. As a result, repeated usage depends on more than price or habit. It depends on how customers evaluate the service process over time.

Recent research on digital platforms has repeatedly shown that continuance intention is strongly affected by service-related evaluations, including satisfaction, perceived value, trust, and perceived service quality (Gao et al., 2023; Kim & Lee, 2023; Utami et al., 2025; Yu et al., 2024). Yet fresh food e-commerce is not merely another online retail format. It introduces high uncertainty around freshness, quantity, substitutions, packaging integrity, and delivery punctuality. In these conditions, customers do not passively receive service. They actively search, compare, interpret, and coordinate. Customer participation is therefore not peripheral to the service encounter. It is part of the service process itself.

This observation matters because most existing studies still treat customer participation in broad or aggregated terms, often under the labels of engagement, interaction, or co-creation. Such approaches are useful for establishing that participation matters, but they are less useful for explaining how specific participation forms create value. In practical settings, task cognition is not the same as information seeking, and neither is equivalent to effort expenditure or human-computer interaction. These dimensions vary in cognitive demands, behavioural intensity, and technological dependence. When they are collapsed into a single construct, the field loses the ability to identify which forms of participation are most likely to generate favourable service evaluations and which are most vulnerable to digital friction (Islam et al., 2023; Rather et al., 2022).

A second limitation concerns the role of perceived service quality. Although service quality is widely recognised as a key predictor of loyalty and continuance in digital services, it is often modelled as an independent predictor rather than as a process mechanism through which upstream customer activities become downstream behavioural persistence (Kim & Yum, 2024; Nguyen et al., 2024). This leaves an important question insufficiently answered: when customers participate more actively in fresh food e-commerce, why does that participation sometimes strengthen retention and sometimes fail to do so? One plausible answer is that participation affects continuance intention only when it is successfully converted into favourable perceptions of service quality.

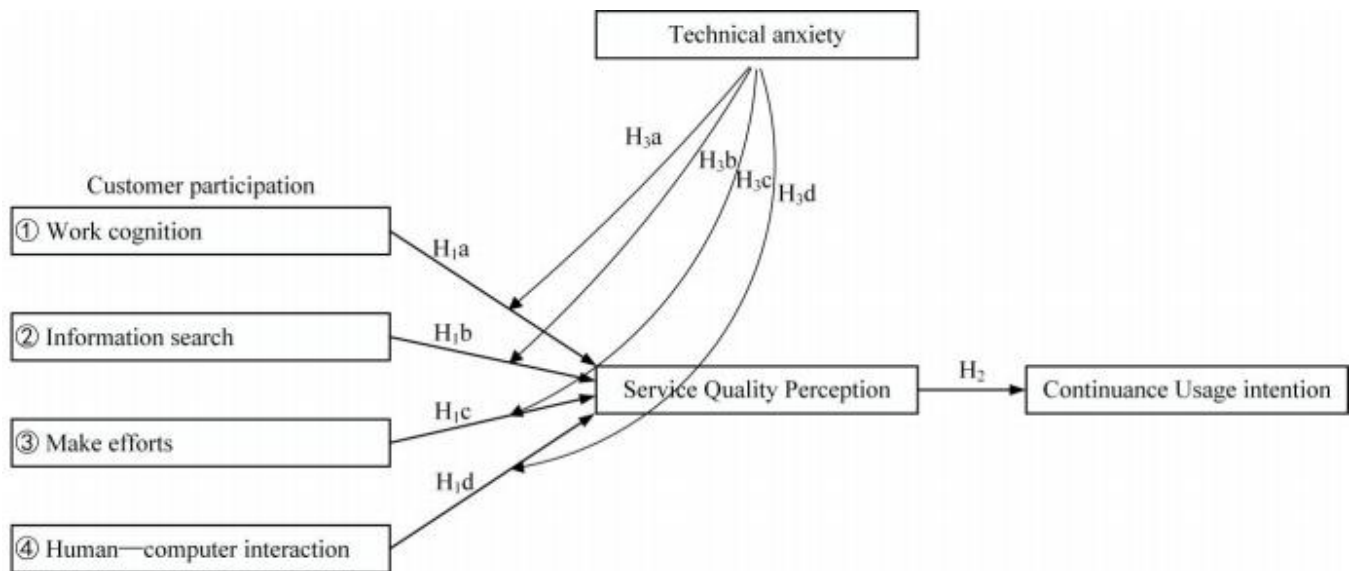
A third limitation lies in the treatment of digital psychological barriers. Technology anxiety is usually examined as a direct inhibitor of adoption, intention, or satisfaction. However, in technology-mediated retail environments, it may be more analytically useful to treat anxiety as a boundary condition that changes the effectiveness of participation. A customer may search extensively for information, compare options carefully, and still emerge with a weak or negative service evaluation if technological complexity, uncertainty, or overload disrupts the interpretive process. This possibility is especially relevant in fresh food e-commerce because service judgements depend heavily on digitally conveyed information about origin, freshness, logistics, and platform reliability (Jiao et al., 2025; Sarker et al., 2025; Tarhini et al., 2021).

This article addresses these issues by developing an integrated model in which four dimensions of customer participation - task cognition, information seeking, effort expenditure, and human-computer interaction - influence continuance intention through perceived service quality, while technology anxiety operates as a moderator of the participation-service quality relationship. The empirical analysis is based on users of fresh food e-commerce platforms in Guangdong Province, one

of China’s most dynamic regional markets in this domain. Guangdong is an analytically strong site because it combines advanced digital infrastructure, dense platform competition, and a consumer base with substantial exposure to app-based fresh food purchasing. The combination of these characteristics makes it possible to study not simply whether users adopt these services, but how they decide to continue using them.

The article makes three contributions. First, it differentiates customer participation into behaviourally distinct dimensions and demonstrates that their effects are not homogeneous. Second, it clarifies the mediating role of perceived service quality in the participation-continuance relationship. Third, it shows that technology anxiety constrains participation selectively rather than universally. These contributions speak directly to contemporary research on digital retail continuance, online service evaluation, and technology-mediated consumer behaviour.

Figure 1. Conceptual framework



2. Literature Review and Hypotheses Development

Customer participation is best understood as the set of customer-contributed cognitive and behavioural inputs that shape the service process. In digital service environments, participation includes not only visible interaction but also information work, task management, procedural effort, and technology-enabled coordination. Contemporary reviews of online customer engagement suggest that participation should be analysed as a differentiated construct because distinct forms of customer input serve distinct functions in value co-creation (Islam et al., 2023; Rather et al., 2022). The current study follows this logic and isolates four dimensions that are especially relevant in fresh food e-commerce.

Task cognition refers to the degree to which customers understand the tasks required to use the platform effectively. In fresh food e-commerce, users often need to interpret product specifications, delivery choices, promotional rules, and service procedures before completing a purchase. Stronger task cognition should improve perceived service quality because customers who understand the system better can judge platform performance more accurately and use available service functions more effectively. Prior studies linking customer participation to service-quality assessments suggest that cognitively prepared customers are more likely to generate positive service evaluations when the platform performs adequately (Wang & Wei, 2011; Wu & Chen, 2017).

Information seeking refers to the active acquisition, comparison, verification, and interpretation of product and service information. This dimension is highly salient in fresh food e-commerce because uncertainty is high and many quality attributes are experienced only after delivery. To reduce uncertainty, customers rely on reviews, descriptions, origin information, traceability cues, promotions, and platform signals. Information seeking can therefore strengthen perceived service quality by allowing users to interpret the platform as transparent, informative, and trustworthy. Research on digital shopping and continuance intention supports this expectation, especially in contexts where uncertainty reduction is central to user retention (Gao et al., 2023; Jiao et al., 2025).

Effort expenditure refers to the behavioural resources customers invest while using the platform, including the time and energy spent comparing alternatives, arranging deliveries, managing discounts, and coordinating orders. In some settings, customer effort may create fatigue, but in highly interactive service systems it can also intensify process involvement and strengthen the customer's sense of control. In fresh food e-commerce, where customers often need to coordinate highly practical choices, effort expenditure may become a critical driver of perceived service quality if the platform rewards effort with accurate information, reliable fulfilment, and smooth transaction management. The likely implication is that effort expenditure will be positively associated with perceived service quality and may even emerge as one of the strongest drivers.

Human-computer interaction refers to the quality of interaction between users and platform interfaces, automated functions, recommendation systems, and digital guidance. In digital retail, interface quality affects how easy it is to browse, compare, decide, and resolve problems. Studies of virtual customer service agents and interface design show that better interaction quality can improve consumer perceptions and behaviour by enhancing social presence, responsiveness, and procedural fluency (Chattaraman et al., 2022; Verhagen et al., 2021). In fresh food e-commerce, repeated app use makes this dimension structurally important because customer retention depends on routinised and low-friction digital interaction.

Perceived service quality is positioned in this study as the central evaluative mechanism that translates participation into continuance intention. In e-commerce settings, service quality has been consistently associated with trust, customer satisfaction, loyalty, and long-term platform usage (Kim & Lee, 2023; Kim & Yum, 2024; Nguyen et al., 2024). In the fresh food context, however, service quality is broader than interface or delivery quality alone. It includes confidence in product condition, timeliness, information completeness, packaging integrity, responsiveness, and the platform's ability to support repeated daily purchasing without undue uncertainty. This broader conception is particularly appropriate when studying retention rather than one-off transactions.

The article adopts a stimulus-organism-response perspective. Customer participation serves as the stimulus because it reflects what users do within the service environment. Perceived service quality serves as the organism because it captures the internal evaluation formed through the service encounter. Continuance intention serves as the response because it reflects the behavioural tendency to continue using the platform. This perspective is useful because it offers a mechanism-based explanation rather than a simple predictor-outcome account, thereby clarifying why participation matters only when it becomes meaningful in evaluative terms (Gao et al., 2023; Utami et al., 2025).

On this basis, the first set of hypotheses concerns the direct relationships between the four dimensions of customer participation and perceived service quality. Customers with stronger task cognition should evaluate service more favourably because they can align platform functions with shopping objectives. Customers who seek information actively should perceive better service when the platform provides useful and credible informational support. Customers who expend effort should judge service more positively when that effort is rewarded with successful execution. Customers who experience better human-computer interaction should likewise generate stronger service-quality evaluations. The overarching expectation is therefore that each participation dimension positively influences perceived service quality.

The next proposition concerns the relationship between perceived service quality and continuance intention. Recent digital-platform studies consistently show that users persist when service quality is perceived as reliable, effective, and credible over time (Dandis et al., 2026; Yu et al., 2024). In fresh food e-commerce, where transactions are frequent and service failures are especially visible, the service-quality judgement should have strong behavioural consequences. A customer who repeatedly perceives the service to be timely, transparent, and dependable is more likely to continue using the platform, recommend it, and integrate it into everyday shopping routines.

The mediating logic follows directly from these assumptions. If customer participation shapes perceived service quality, and perceived service quality shapes continuance intention, then service quality should function as a mechanism that carries part of the effect of participation into post-adoption persistence. This addresses a notable gap in the literature, because studies on customer participation often emphasise direct co-creation effects, whereas service-quality studies often focus on downstream loyalty-related outcomes without adequately modelling the upstream role of participation (Huang & Benyoucef, 2022; Nguyen et al., 2024). The resulting analytical advantage is that the model can explain not only whether participation matters,

but how it matters.

Technology anxiety provides the model's boundary condition. Technology anxiety describes user discomfort, worry, or tension when dealing with digital systems and technologically mediated service processes. Recent work indicates that anxiety can undermine confidence, satisfaction, and continuance intention in digital services by increasing perceived complexity and reducing evaluative certainty (Sarker et al., 2025; Tarhini et al., 2021). In fresh food e-commerce, anxiety is likely to matter because many service judgements rely on interpreting digitally presented signals rather than physically inspecting products before purchase.

The moderating effect of technology anxiety should not be assumed to be identical across all participation forms. Information seeking is likely to be the most vulnerable because it depends heavily on search fluency, interface clarity, information credibility, and users' ability to process platform cues. Task cognition is cognitively demanding, but it may not be equally disrupted once users become familiar with core platform tasks. Effort expenditure may even remain beneficial under anxiety if it is directed toward concrete shopping outcomes rather than abstract technological interpretation. Human-computer interaction may be somewhat weakened by anxiety, but the effect could be modest in mature app environments where common interface patterns are already familiar. This differentiated view leads to separate moderation hypotheses rather than a single global expectation.

H1a: Task cognition positively influences perceived service quality.

H1b: Information seeking positively influences perceived service quality.

H1c: Effort expenditure positively influences perceived service quality.

H1d: Human-computer interaction positively influences perceived service quality.

H2: Perceived service quality positively influences continuance intention.

H3a: Technology anxiety negatively moderates the relationship between task cognition and perceived service quality.

H3b: Technology anxiety negatively moderates the relationship between information seeking and perceived service quality.

H3c: Technology anxiety negatively moderates the relationship between effort expenditure and perceived service quality.

H3d: Technology anxiety negatively moderates the relationship between human-computer interaction and perceived service quality.

3. Research Method

The study used a quantitative cross-sectional design and collected data through a structured questionnaire administered to users of fresh food e-commerce platforms in Guangdong Province, China. Guangdong was selected because it represents one of China's most developed digital retail regions and hosts a dense mix of national-platform branches, regional vertical platforms, and online supermarket services. This makes the province a suitable empirical setting for studying continuance intention under conditions of intense platform competition and mature consumer exposure.

The target population consisted of consumers with actual experience of purchasing fresh food products through e-commerce platforms. To preserve contextual relevance, the screening mechanism excluded respondents who had not used fresh food e-commerce platforms in Guangdong, who purchased less than once per month, who were under the age of 18, or whose completion time suggested inattentive responding. This procedure was designed to minimise contamination from irrelevant or low-quality responses. Of 570 distributed questionnaires, 550 were retained as valid, producing a valid response rate of 96.5 percent.

The sample structure is consistent with the actual user profile of fresh food e-commerce. The sample was balanced by gender, with 48.0 percent male and 52.0 percent female respondents. In age terms, the user base was concentrated in the 25-34 and 35-44 brackets, which together represented 65.1 percent of valid responses. Educational attainment was also relatively high, with bachelor's degree holders forming the largest category and associate-degree holders the second largest. The source study also reports coverage across core Pearl River Delta cities, non-core Pearl River Delta cities, and eastern, western, and northern Guangdong, together with multiple platform categories and usage-frequency groups, thereby supporting contextual diversity within the sample.

All latent variables were measured using five-point Likert-type scales. Customer participation was operationalised through

four reflective dimensions: task cognition, information seeking, effort expenditure, and human-computer interaction. Perceived service quality was specified as the mediating variable, continuance intention as the dependent variable, and technology anxiety as the moderating variable. The instrument drew on prior scale sources reported in the thesis and was adapted to the specific conditions of fresh food e-commerce. The adaptation process ensured that the items referred directly to behaviours such as evaluating freshness-related information, comparing alternatives, expending effort in platform use, and interacting with digitally mediated service functions.

The instrument-development process involved both pre-testing and pilot testing. The pilot stage used 40 users with actual fresh food e-commerce experience to assess content validity, convergent validity, and item comprehensibility. According to the thesis, item-level content validity ratios exceeded the pre-specified threshold, factor loadings were generally acceptable, item-total correlations were adequate, and understandability scores were high. Items were refined where necessary to reduce ambiguity, improve flow, and limit respondent fatigue. This procedure strengthened the measurement instrument before formal large-sample deployment.

Data analysis was conducted in two stages. SPSS 27.0 was used for screening, coding, descriptive analysis, and preliminary diagnostics. SmartPLS 4.1.1 was then used to estimate the measurement model and structural model. The PLS-SEM approach is appropriate for a study that includes multiple latent variables, direct effects, mediation, and moderation. The thesis reports that model estimation was supported by bootstrapping with 5,000 resamples, enabling significance testing for the structural paths. Reliability was assessed using Cronbach's alpha and composite reliability, while convergent and discriminant validity were examined through factor loadings, average variance extracted, the Fornell-Larcker criterion, and HTMT.

Table 1. Respondent profile (N = 550)

Characteristic	Category	N	%
Gender	Male	264	48.0
Gender	Female	286	52.0
Age	18-24	83	15.1
Age	25-34	193	35.1
Age	35-44	165	30.0
Age	45-54	83	15.1
Age	55 and above	26	4.7
Education	High school or below	138	25.1
Education	Associate degree	165	30.0
Education	Bachelor's degree	193	35.1
Education	Master's degree or above	54	9.8

Table 2. Construct reliability

Construct	Cronbach's alpha	Composite reliability
Task cognition	0.876	0.892
Information seeking	0.861	0.899
Effort expenditure	0.872	0.906
Human-computer interaction	0.885	0.916
Perceived service quality	0.877	0.908
Continuance intention	0.873	0.908
Technology anxiety	0.907	0.929

Beyond reliability, the source thesis reports acceptable factor loadings, average variance extracted above the minimum threshold, and satisfactory discriminant validity based on the Fornell-Larcker criterion and HTMT. These diagnostics suggest that the reflective measurement model was suitable for hypothesis testing.

4. Data Analysis Results

The descriptive analysis suggests that the sample provides a credible basis for investigating continuance intention in fresh food e-commerce. The dominance of the 25-44 age group is analytically consistent with the primary user base of app-mediated shopping services. The balanced gender distribution and medium-to-high educational profile further indicate that the sample contains users likely to engage meaningfully with platform information, service choices, and interface functions. This is important because the conceptual model assumes that continuance intention is shaped by active participation rather than passive platform exposure.

The measurement model performed satisfactorily. Cronbach's alpha ranged from 0.861 to 0.907, and composite reliability ranged from 0.892 to 0.929, comfortably exceeding accepted thresholds for internal consistency. According to the thesis, convergent and discriminant validity were also supported through factor loadings, average variance extracted, the Fornell-Larcker criterion, and HTMT. The source study further reports no serious common-method bias and no problematic multicollinearity. These diagnostics collectively indicate that the data were suitable for structural modelling.

Model fit and explanatory-power indicators were acceptable for a consumer-behaviour study of this kind. The SRMR value was 0.041 for both the saturated and estimated models. The structural model explained 40.3 percent of the variance in perceived service quality and 34.2 percent of the variance in continuance intention. These values indicate moderate explanatory power and are substantively meaningful because continuance intention in digital retail is typically influenced by numerous situational, psychological, and operational factors beyond the present model.

The structural results strongly support the argument that customer participation matters for service-quality formation. All four participation dimensions significantly and positively influenced perceived service quality. Effort expenditure produced the strongest effect ($\beta = 0.239$, $p < 0.001$), followed by information seeking ($\beta = 0.165$, $p < 0.001$), human-computer interaction ($\beta = 0.162$, $p < 0.001$), and task cognition ($\beta = 0.122$, $p = 0.003$). These results show that participation in fresh food e-commerce is not merely symbolic. It contributes to the formation of quality evaluations in concrete and measurable ways.

The direct effects on continuance intention were also significant. Information seeking had the largest direct effect on continuance intention ($\beta = 0.209$, $p < 0.001$), followed by effort expenditure ($\beta = 0.192$, $p < 0.001$), task cognition ($\beta = 0.129$, $p = 0.002$), and human-computer interaction ($\beta = 0.112$, $p = 0.007$). Perceived service quality positively influenced continuance intention as well ($\beta = 0.185$, $p < 0.001$). Taken together, these results indicate that continuance intention is shaped both by what customers do on the platform and by how they evaluate the service process that follows from those activities.

The mediation pattern is therefore consistent with partial mediation. Each participation dimension significantly predicted perceived service quality, perceived service quality significantly predicted continuance intention, and the direct effects of participation on continuance intention remained significant. This implies that customer participation influences repeated platform use through two routes. One route is evaluative: participation enhances perceived service quality, which then strengthens continuance intention. The other route is direct: participation itself appears to build familiarity, confidence, procedural competence, or involvement that independently supports repeated usage.

Technology anxiety produced two important results. First, it had a significant direct negative effect on perceived service quality ($\beta = -0.280$, $p < 0.001$), which means that digitally anxious users evaluate service less favourably overall. Second, its moderating effect was selective rather than universal. Only the interaction between technology anxiety and information seeking was significant ($\beta = -0.178$, $p < 0.001$). The interactions with task cognition ($\beta = -0.052$, $p = 0.270$), effort expenditure ($\beta = -0.004$, $p = 0.939$), and human-computer interaction ($\beta = -0.082$, $p = 0.078$) were not significant. This pattern suggests that technology anxiety chiefly disrupts those participation processes that depend on digital information handling and interpretive confidence.

Overall, the empirical evidence supports the core logic of the model. Customer participation contributes materially to continuance intention, perceived service quality functions as a meaningful transmission mechanism, and technology anxiety selectively constrains the informational pathway rather than the entire participation-service quality relationship. The strongest positive influence on perceived service quality comes from effort expenditure, while the clearest negative boundary effect of technology anxiety appears in the information-seeking route.

Table 3. Model fit and explanatory power

Indicator	Value	Interpretation
SRMR (saturated model)	0.041	Acceptable fit
SRMR (estimated model)	0.041	Acceptable fit
R-squared: perceived service quality	0.403	Moderate explanatory power
R-squared: continuance intention	0.342	Moderate explanatory power

Table 4. Structural path estimates

Path	Beta	t-value	p-value	Result
Task cognition → perceived service quality	0.122	3.006	0.003	Supported
Information seeking → perceived service quality	0.165	4.022	0.000	Supported
Effort expenditure → perceived service quality	0.239	5.482	0.000	Supported
Human-computer interaction → perceived service quality	0.162	4.055	0.000	Supported
Perceived service quality → continuance intention	0.185	3.530	0.000	Supported
Task cognition → continuance intention	0.129	3.077	0.002	Supported
Information seeking → continuance intention	0.209	4.579	0.000	Supported
Effort expenditure → continuance intention	0.192	3.958	0.000	Supported
Human-computer interaction → continuance intention	0.112	2.688	0.007	Supported
Technology anxiety → perceived service quality	-0.280	6.385	0.000	Supported

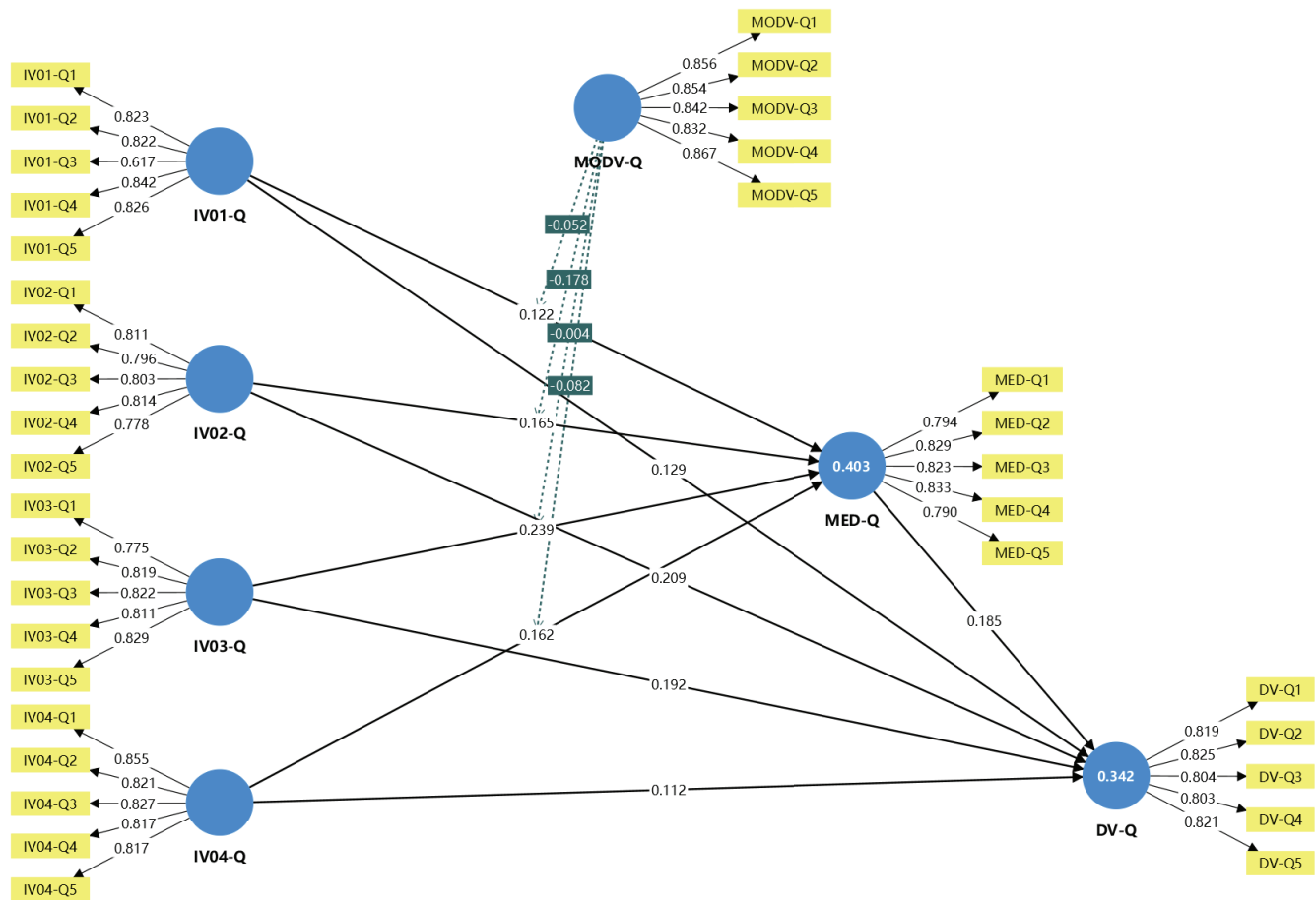
Table 5. Moderating effects of technology anxiety

Interaction path	Beta	p-value	Result
Technology anxiety × task cognition → perceived service quality	-0.052	0.270	Not supported
Technology anxiety × information seeking → perceived service quality	-0.178	0.000	Supported
Technology anxiety × effort expenditure → perceived service quality	-0.004	0.939	Not supported
Technology anxiety × human-computer interaction → perceived service quality	-0.082	0.078	Not supported

Table 6. Mediation interpretation through perceived service quality

Antecedent	Direct path to continuance intention	Path to perceived service quality	Indirect route via service quality	Interpretation
Task cognition	Significant	Significant	Present	Partial mediation
Information seeking	Significant	Significant	Present	Partial mediation
Effort expenditure	Significant	Significant	Present	Partial mediation
Human-computer interaction	Significant	Significant	Present	Partial mediation

Figure 2. Estimated structural model



5. Discussion

The most immediate theoretical implication of the results is that customer participation in fresh food e-commerce is internally differentiated. The four participation dimensions all matter, but they do not matter equally. Effort expenditure emerged as the strongest driver of perceived service quality. This is not a trivial finding. It indicates that value creation in fresh food e-commerce is closely tied to practical, process-oriented engagement. Customers who invest effort in comparing products, arranging delivery windows, and optimising purchase choices are not simply doing extra work for the platform. When the platform performs well, their effort becomes part of the mechanism through which high service quality is perceived.

This result is especially plausible in fresh food e-commerce because service production is partly co-managed by the customer. The customer determines delivery time relevance, product substitution tolerance, price-quality trade-offs, and acceptable levels of uncertainty regarding freshness and fulfilment. In such a setting, effort expenditure represents not friction alone but also procedural involvement. The stronger effect of effort expenditure therefore suggests that service quality in fresh food e-commerce is judged not only on what the platform provides, but on how well the platform allows users to turn their effort into reliable outcomes. This insight aligns with recent work emphasising operational coordination and service-value creation in fresh e-commerce (Imanuddin et al., 2025; Ren et al., 2025).

Information seeking also played a substantial role, both directly and indirectly. Yet it was the only pathway significantly weakened by technology anxiety. This is perhaps the article’s most distinctive contribution. Information seeking depends on customers’ ability to search, interpret, compare, and trust digital information. In fresh food e-commerce, these tasks are particularly demanding because users must infer quality from proxies rather than direct inspection. When users are technologically anxious, the information environment may become cognitively costly rather than reassuring. Search becomes overload, comparison becomes confusion, and recommendation systems become sources of mistrust rather than support. The finding therefore refines the role of technology anxiety by showing that anxiety undermines not participation in general, but specific forms of participation that depend on digital interpretive work.

The absence of significant moderation for task cognition, effort expenditure, and human-computer interaction is equally informative. The result for task cognition suggests that once customers grasp the basic platform tasks, residual anxiety may not be sufficient to reduce the value of that understanding. The result for effort expenditure suggests that practical effort remains beneficial even for anxious users, perhaps because effort is directed toward visible shopping outcomes. The result for human-computer interaction may indicate that interface design on mature fresh food e-commerce platforms has become sufficiently standardised that anxiety no longer creates systematically divergent evaluations, at least not strongly enough to reach statistical significance in this sample.

Perceived service quality emerged as a meaningful but partial mediator. This matters because it helps reconcile two literatures that often develop in parallel. Customer-participation studies tend to emphasise co-creation and involvement, whereas service-quality studies focus on downstream attitudinal and behavioural outcomes. The present findings show that both perspectives are needed. Customer participation affects continuance intention partly because it changes how customers judge service quality and partly because it builds a direct behavioural orientation toward continued use. In practical terms, this means that repeated usage arises from both evaluative confidence and participatory embeddedness.

The significance of the direct effects is also noteworthy. Information seeking had the strongest direct effect on continuance intention, even though effort expenditure had the strongest effect on perceived service quality. This divergence suggests that not all participation dimensions influence post-adoption behaviour through the same mechanism. Information seeking may directly strengthen continuance intention because it increases customer knowledge, familiarity, and decision confidence, even beyond its effect on service-quality evaluation. Effort expenditure, by contrast, appears especially important for transforming the service process into a positive quality judgement. The coexistence of these differentiated routes strengthens the argument for analysing customer participation dimensionally rather than holistically.

Another important implication concerns the role of service quality in high-frequency online retail. In many digital-platform models, continuance intention is explained through generic post-adoption constructs such as satisfaction or perceived usefulness. The current findings suggest that, in fresh food e-commerce, perceived service quality remains central because the service is recurrent, operationally demanding, and exposed to tangible failure points. Customers are unlikely to continue using platforms that fail on delivery, quality consistency, or information credibility even if the overall concept is convenient. Service quality therefore acts as the bridge between participation and retention precisely because it captures the customer's accumulated judgement of whether the platform can be trusted in routine household provisioning.

The Guangdong context sharpens these conclusions rather than limiting them conceptually. In a region characterised by mature platform competition and relatively advanced infrastructure, the retention problem is no longer whether consumers know these services exist. It is whether they continue to judge them as dependable enough to integrate into everyday life. That makes Guangdong an analytically strong setting for uncovering the behavioural logic of continuance intention. If the model works under such competitive and technologically mature conditions, it captures an important part of the retention challenge that fresh food e-commerce platforms face more broadly.

6. Theoretical Implications

The article contributes to theory in three principal ways. First, it advances customer-participation research by providing empirical evidence that participation is multidimensional in a substantively consequential sense. The dimensions differ not only conceptually but also in explanatory strength. Second, it reinforces a mechanism-based understanding of continuance intention by demonstrating that perceived service quality mediates the effect of customer participation on repeated platform use. Third, it refines the role of technology anxiety by showing that anxiety operates selectively. Rather than weakening all participation-service quality pathways, it significantly constrains the information-seeking route only.

These contributions matter because they move the literature away from overly general claims that participation is uniformly beneficial and that technology anxiety is uniformly harmful. The present findings support a more precise interpretation: participation creates value when the platform converts customer effort and information work into favourable quality judgements, and technology anxiety interferes with this conversion mainly where customers must process and trust digitally conveyed information.

7. Managerial Implications

For managers, the first implication is that participation should be designed rather than merely encouraged. Since effort expenditure had the strongest positive effect on perceived service quality, platforms should improve those stages in which customers actively coordinate the transaction. Delivery-slot selection, product comparison, order adjustment, substitution management, and after-sales handling should be as smooth and transparent as possible. The more clearly customer effort is rewarded with reliable execution, the more likely it is to generate positive service-quality evaluations.

Second, the negative moderation effect of technology anxiety on the information-seeking pathway indicates that platform information architecture is a retention issue, not just a usability issue. Platforms should reduce informational friction by improving product-page clarity, traceability visibility, review organisation, search accuracy, and recommendation transparency. Technology-anxious customers are especially likely to disengage when search and comparison feel cognitively costly or opaque. Simplified navigation, explanation cues, and stronger information credibility signals may therefore yield disproportionate benefits for retention.

Third, the direct negative effect of technology anxiety on perceived service quality suggests a need for user segmentation. Platforms should recognise that customers differ not only by spending level or purchase frequency but also by digital comfort. More supportive pathways for anxious users - such as guided purchasing flows, stable reordering options, visible human support, and fewer unexplained interface interventions - can improve service-quality perception without requiring major changes in product assortment or pricing. In high-frequency categories like fresh food, these seemingly modest interface and service-design choices can accumulate into substantial retention advantages.

8. Conclusion, Limitations, and Future Research

This article examined continuance intention in fresh food e-commerce by integrating customer participation, perceived service quality, and technology anxiety into a single framework. Using survey data from 550 platform users in Guangdong Province and PLS-SEM analysis, the study found that all four participation dimensions positively influence perceived service quality and that perceived service quality positively influences continuance intention. Effort expenditure emerged as the strongest driver of perceived service quality, while technology anxiety significantly weakened only the information-seeking pathway. The evidence therefore shows that customer participation matters, but it matters through differentiated and conditional pathways.

The study has several limitations. The design is cross-sectional and based on self-reported data, which limits causal inference despite the diagnostic procedures reported in the thesis. The empirical setting is restricted to Guangdong Province, which improves contextual precision but may reduce transferability to less mature or differently structured markets. In addition, the model focuses on a targeted set of variables and therefore does not incorporate other potentially relevant constructs such as trust, privacy concern, platform dependence, perceived value, or algorithmic transparency. Future research could address these limitations through longitudinal designs, transaction-data integration, multi-group comparisons, and richer digital-psychology models. Cross-platform and cross-regional replication would also help clarify the conditions under which the present findings generalise beyond the Guangdong fresh food e-commerce context.

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Reference

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