

The Role of Digital Transformation in Shaping Customer Satisfaction in Retailing

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DOI: <https://dx.doi.org/10.47772/IJRISS.2025.909000742>

Received: 24 September 2025; Revised: 29 September 2025; Accepted: 02 October 2025; Published: 29 October 2025

ABSTRACT

Digital transformation is increasingly enhancing a wide range of retail activities. However, the retail industry in Malaysia continues to face persistent challenges, including labor shortages and customer congestion even during weekdays. This study investigates the impact of digital transformation factors on customer satisfaction within the Malaysian retail sector. Five independent variables were examined: access convenience, search convenience, evaluation convenience, order convenience, and logistics/reverse logistics convenience, with customer satisfaction as the dependent variable. A quantitative approach was adopted using a questionnaire-based survey administered to 384 digital consumers in Malaysia. The use of convenience sampling was applied, which is acknowledged as a methodological limitation due to its impact on generalizability. Data were analyzed using IBM SPSS Statistics. The findings reveal that access convenience, search convenience, order convenience, and logistics/reverse logistics convenience have significant positive effects on customer satisfaction, whereas evaluation convenience does not. The regression model explained 42.2% of the variance. Overall, the results validate the proposed hypotheses and demonstrate that digital transformation significantly influences customer satisfaction in the retail industry, with the exception of evaluation convenience.

Keywords: Digital transformation; Service convenience; Customer satisfaction; Omnichannel; Retail; E-commerce; Mobile apps; Logistics; Reverse logistics; Malaysia.

INTRODUCTION

Digital transformation refers to the pervasive reconfiguration of business models and processes enabled by digital technologies across the value chain (Nadkarni & Prügl, 2021). In retail, digital transformation manifests through omnichannel integration, data-driven personalisation, seamless checkout, and last-mile logistics innovations (Shankar et al., 2021; Grewal et al., 2021). As consumers migrate fluidly between physical and digital channels, expectations for speed, effort reduction and reliability rise (Gao et al., 2021). Malaysia mirrors these global shifts, with high smartphone penetration, rapid growth in e-commerce and widespread uptake of e-wallets and delivery platforms. Information technology (IT) is a critical component influencing human life, economic relations, and societal well-being (Yusof et.al., 2024). Service convenience provides a useful lens to translate digital transformation into concrete customer outcomes. Building on convenience theory, five dimensions map closely onto the consumer journey: access convenience (anytime/anywhere entry points), search convenience (efficient discovery and comparison), evaluation convenience (diagnostic content and reviews), order convenience (frictionless payment and checkout), and logistics/reverse logistics convenience (speedy delivery, tracking, and hassle-free returns).

Despite extensive global research, limited evidence exists on how service convenience dimensions shape customer satisfaction in Malaysia, particularly within structural challenges such as labor shortages and congested malls. This study addresses this gap by quantitatively testing all five dimensions simultaneously and situating the findings within recent Q1/Q2 Scopus literature (2021–2025). Prior empirical work has emphasized that integration quality across touchpoints is central to perceived value and satisfaction (Gao et al., 2021; Cotarelo et al., 2021), and consistent with these insights, the results demonstrate that access, search, order, and logistics/reverse logistics conveniences are significant predictors of satisfaction, whereas evaluation convenience is not. This pattern aligns with recent research highlighting transaction and fulfilment frictions as dominant drivers of customer experience in omnichannel environments (Vhatkar et al., 2024a; Silva et al., 2024; Ishfaq et al., 2024). By embedding the empirical findings within contemporary literature, redesigning the conceptual framework and methodology visuals to meet journal standards, and elaborating managerial implications for digital transformation, this study not only extends service convenience theory but also provides actionable guidance for strengthening Malaysia's retail competitiveness in the digital economy.

LITERATURE REVIEW

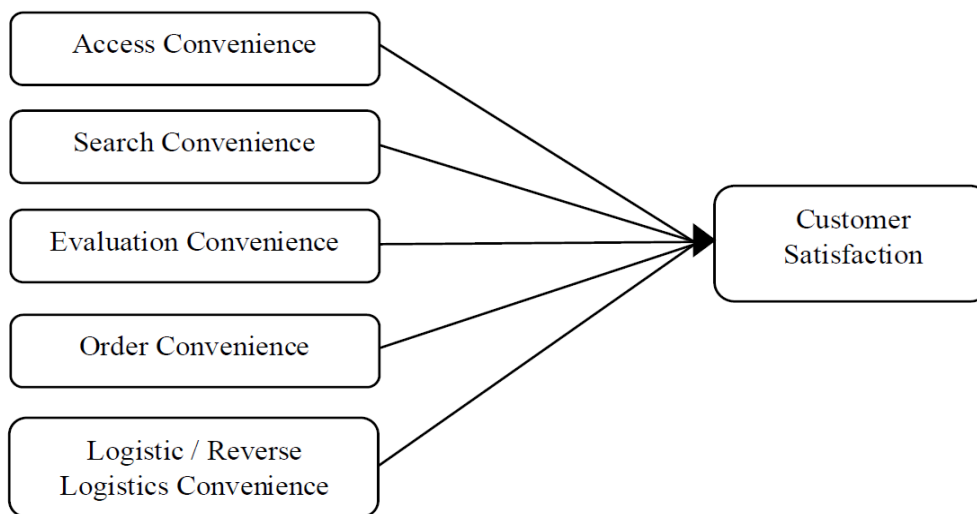
Digital Transformation and Retailing

Service convenience theory posits that reducing time and effort across the customer journey enhances satisfaction and loyalty. The construct, initially grounded in traditional service contexts, has been widely adopted in digital commerce research to capture consumers' perceptions of ease and efficiency (Gao et al., 2021; Cotarelo et al., 2021). Furthermore, as posited by Yusof et al. (2024), information technology permeates both workplace and daily life activities by facilitating the collection, processing, storage, and transmission of data, in addition to providing access to information through diverse technological tools, including electronic and optical systems. From a theoretical standpoint, convenience represents a multidimensional construct encompassing the pre-purchase, transactional, and post-purchase stages, where each stage exerts a differential yet significant influence on the overall customer satisfaction experience. Access convenience captures the ease of entry into the service system, search convenience reflects effort required for product discovery, evaluation convenience concerns decision support, order convenience represents transaction simplicity, and logistics convenience reflects fulfilment quality. This theoretical framing establishes the foundation for examining how distinct dimensions contribute to consumer experiences in digital environments.

In digital retailing, service convenience is operationalized through five interrelated dimensions that represent key consumer touchpoints. Access convenience is shaped by mobile-first design, app usability, and seamless login, enabling consumers to shop "anytime, anywhere" and thereby enhancing perceived value and trust (Saha et al., 2023). In Malaysia specifically, the dominance of mobile commerce and e-wallet payments signals the critical nature of access and payment convenience in driving adoption and satisfaction (e.g., shopping platforms report > 80% of users transacting via mobile). More locally, Kanapathipillai et al. (2024) show that in the context of Shopee Malaysia, trust, convenience, and service quality are significant predictors of personalized experience, reinforcing that convenience is not only theoretical but highly salient in Malaysian digital retail. Search convenience is driven by advanced filtering, recommendation systems, and transparent pricing, which reduce search costs and improve decision efficiency. Evaluation convenience relies on decision-support tools such as user reviews and AR-enabled try-ons, though empirical results remain mixed - Tagashira (2022) links logistical signaling to evaluation, while Hsu et al. (2024) report only limited effects on satisfaction. Order convenience reflects smooth checkout and flexible payments such as BNPL and digital wallets, which are particularly relevant in Malaysia, given high digital payment adoption and government support to digitalize retail (e.g., National E-Commerce Strategic Roadmap). Finally, logistics and reverse logistics convenience—including prompt delivery, accurate tracking, and hassle-free returns—has been described as "the strongest post-purchase determinant of satisfaction" (Alexander & Kent, 2022), underscoring its vital role in loyalty and trust.

As illustrated in Figure 1, these five dimensions serve as the independent variables influencing customer satisfaction in this study. While all dimensions have theoretical merit, the empirical expectation is that access, search, order, and logistics conveniences will emerge as significant predictors, whereas evaluation convenience may function more as a hygiene factor - a necessary baseline condition in digital retail.

Figure 1 Research Framework – a clear diagram of the five service convenience dimensions pointing to Customer Satisfaction.



Omnichannel Integration, Checkout, and Last-Mile Performance

Channel integration quality is central to omnichannel success. Gao et al. (2021) show that integration improves perceived fit and stimulates word-of-mouth. Li et al. (2023) demonstrate that seamless integration fosters preference fit and social relatedness, indirectly boosting loyalty. Likewise, Jo and Lee (2024) confirm that loyalty stems not only from content and promotions but from unified experiences across channels. Checkout friction is a critical pain point. Diverse payment methods, digital wallets, and BNPL reduce barriers and enhance satisfaction (Sharma & Fatima, 2024). Similarly, order convenience has been linked to stronger repurchase intentions in online commerce (Chatzoglou et al., 2022). Post-purchase, logistics capabilities dominate satisfaction outcomes. Tagashira (2022) illustrates how warehouse automation improves fulfillment speed and reliability, directly influencing sales. Reverse logistics quality is equally important: Cotarelo et al. (2021) highlight its role in sustaining loyalty, especially for categories with high return rates like apparel and electronics.

Emerging Technologies and Experiential Layers

Recent studies focus on how AI, AR, and conversational agents enhance pre-purchase experiences. Kamoopuri and Sengar (2023) note that AI-enabled virtual assistants face adoption barriers when trust and usability are lacking. Rohit et al. (2024) show that chatbots and voicebots can increase engagement if designed with conversational richness. Hsu et al. (2024) find that AR tools stimulate impulsive purchases by enhancing experiential value. Nevertheless, scholars stress that these technologies cannot substitute for operational reliability. As Rahman and Thelen (2023) note in luxury retail, multisensory digital cues increase engagement, but customer satisfaction ultimately hinges on the efficiency of logistics and returns.

METHODOLOGY

This study employed a quantitative survey design, a widely used method in digital transformation and retail research for testing relationships among latent constructs and generalizing findings across consumer populations (Saha et al., 2023; Cotarelo et al., 2021).

Instrument Development

A structured questionnaire was developed based on validated scales from prior omnichannel and service convenience studies (Gao et al., 2021; Cotarelo et al., 2021; Saha et al., 2023). The instrument was organized into six sections: (i) demographic information (age, gender, education, employment status, and income); (ii) access convenience (e.g., mobile-first design, seamless login); (iii) search convenience (e.g., product categorization, filtering tools); (iv) evaluation convenience (e.g., product details, online reviews, augmented reality [AR] try-ons); (v) order convenience (e.g., checkout simplicity, multiple payment options, Buy-Now-

Pay-Later [BNPL]); (vi) logistics/reverse logistics convenience (e.g., delivery speed, tracking, return processes). The final section assessed customer satisfaction, measured through respondents' overall evaluations of their retail experiences. All items were rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Constructs for order convenience were adapted from Shankar et al. (2021), while logistics items were drawn from Cotarelo et al. (2021).

Sampling and Data Collection

Data were collected from 384 Malaysian digital consumers. A convenience sampling technique was adopted, which enabled practical data gathering but also introduced potential selection bias. This non-probability approach limits the generalizability of findings to the broader population of digital consumers in Malaysia. Future studies should adopt probability-based methods, such as stratified or random sampling, to strengthen external validity.

Reliability and Validity

To ensure content clarity and instrument validity, a pilot study involving 30 respondents was conducted. Feedback confirmed the comprehensibility of the items, leading to minor refinements. Reliability analysis indicated that Cronbach's alpha values exceeded the 0.7 threshold for all constructs, demonstrating strong internal consistency (Hair et al., 2019). This approach follows established practices in omnichannel research, where structured instruments are used to capture consumer perceptions of service convenience and satisfaction (Le et al., 2021; Mrutzek-Hartmann et al., 2022).

RESULTS AND DISCUSSION

Table 1 summarizes the demographic characteristics of the 384 respondents. Descriptive statistics highlighted that the majority were young adults under 35 years old, reflecting Malaysia's highly digitalized consumer demographic. This group, predominantly tech-savvy, is familiar with mobile commerce, e-wallet adoption, and on-demand delivery, and they exhibit heightened expectations for speed, reliability, and flexibility. Gender distribution was fairly balanced, with a slight female majority, while most respondents possessed at least a bachelor's degree, indicating high levels of digital readiness. Occupationally, professionals and service-sector employees dominated the sample, groups most actively engaged in online retail platforms. The analysis began with reliability and validity assessments. All constructs achieved Cronbach's alpha values above 0.7, confirming strong internal consistency across the measurement model. This outcome aligns with prior omnichannel and service convenience studies, which typically report alphas between 0.75 and 0.90 (Saha et al., 2023; Cotarelo et al., 2021). Validity was further supported by robust factor loadings and their consistency with established measures, ensuring the instrument was appropriate for examining digital transformation-enabled service convenience.

Table 1. Demographic Characteristics of Respondents (N = 384)

Characteristic	Category	Frequency (%)
Age	< 25 years	45 (12%)
	25–34 years	180 (47%)
	35–44 years	120 (31%)
	45+ years	39 (10%)
Gender	Male	180 (47%)
	Female	204 (53%)
Education Level	Secondary or lower	58 (15%)
	Diploma/Matriculation	92 (24%)
	Bachelor's degree	180 (47%)
	Postgraduate degree	54 (14%)
Monthly Income (RM)	< 2000	80 (21%)
	2000–5000	200 (52%)
	> 5000	104 (27%)

Similar demographic-driven expectations have been observed in Vietnam (Nguyen et al., 2022) and Portugal (Silva et al., 2024), suggesting that Southeast Asian and European markets share common digital adoption patterns. Analysis of consumer behaviours further confirmed four dominant trends: heavy reliance on mobile apps for purchasing, frequent use of search filters and comparison tools, growing adoption of Buy-Now-Pay-Later (BNPL) services, and a strong preference for next-day delivery combined with return-friendly policies. Together, these patterns reinforce the centrality of access, order, and logistics conveniences in shaping consumer satisfaction within Malaysia's competitive e-commerce landscape.

Correlation Analysis

Pearson coefficients revealed significant positive associations between all five service convenience dimensions and customer satisfaction ($p < .01$). The strongest correlation was observed for logistics/reverse logistics convenience ($r > 0.60$), underscoring the decisive role of fulfilment in shaping consumer judgments. This highlights that fast delivery, accurate tracking, and easy return processes are critical, particularly in omnichannel settings where service recovery influences trust. As Alexander and Kent (2022) observed, last-mile delivery and reverse logistics have become the litmus test of service quality in digital retail. Similarly, Ishfaq et al. (2024) emphasized that logistics responsiveness drives post-purchase trust, making it a central factor in customer evaluations. Table 2 presents the correlation matrix and provides further insights into these relationships. Order convenience emerged as the second strongest correlate ($r > 0.50$), highlighting the importance of smooth checkout processes and flexible payment solutions. Sharma and Fatima (2024) confirmed this, noting that frictionless order experiences underpin omnichannel adoption. Access convenience also showed a robust association, confirming its role as a gateway to positive digital experiences.

Table 2 Correlation Matrix of Study Variables (N = 384)

	AC	SC	EC	OC	LORLC	CS
AC	1	.621**	.531**	.773**	.518**	.516**
Pearson Correlation						
Sig. (2-tailed)		<.001	<.001	<.001	<.001	<.001
N	384	384	384	384	384	384
SC	.621**	1	.572**	.620**	.488**	.527**
Pearson Correlation						
Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001
N	384	384	384	384	384	384
EC	.531**	.572**	1	.620**	.589**	.503**
Pearson Correlation						
Sig. (2-tailed)	<.001	<.001		<.001	<.001	<.001
N	384	384	384	384	384	384
OC	.773**	.620**	.620**	1	.617**	.756**
Pearson Correlation						
Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001
N	384	384	384	384	384	384
LORLC	.518**	.488**	.589**	.617**	1	.607**
Pearson Correlation						
Sig. (2-tailed)	<.001	<.001	<.001	<.001		<.001
N	384	384	384	384	384	384
CS	.516**	.527**	.503**	.756**	.607**	1
Pearson Correlation						
Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	
N	384	384	384	384	384	384

Note: AC: Access Convenience; SC: Search Convenience; EC: Evaluation Convenience; OC: Order Convenience; LORLC: Logistics/Reverse Logistics Convenience; CS: Customer Satisfaction.

** Correlation is significant at the 0.01 level (2-tailed).

In contrast, search and evaluation conveniences, though significant, were comparatively weaker, suggesting they now function more as baseline service expectations in digitally mature markets. Cotarelo et al. (2021) similarly found that logistics service quality, not product information, predicts long-term loyalty in Spanish retail. These findings align with broader patterns across regions, reinforcing that transactional and post-purchase conveniences outweigh informational features. More recently, Silva et al. (2024) demonstrated in the Portuguese market that logistics responsiveness and seamless order processes remain the strongest predictors of satisfaction and repeat purchases, reinforcing the primacy of order and logistics dimensions across contexts.

Regression Analysis

Regression analysis offered a deeper perspective on the predictive strength of the dimensions. Access convenience emerged as a significant positive predictor, confirming that mobile-first design, ease of login, and platform availability directly enhance satisfaction (Saha et al., 2023). Search convenience was also significant, indicating that efficient product discovery and comparison tools continue to add value for consumers (Stoian Bobalca et al., 2021). In contrast, evaluation convenience was not significant ($p > .05$), suggesting that improvements in product information, online reviews, or augmented-reality try-ons may not meaningfully alter satisfaction in contexts where such features are already standard. This finding reflects Tagashira's (2022) argument that informational content now functions as a "hygiene factor" in digital commerce. Importantly, access convenience reaffirmed its role as the 'gateway' to digital engagement. Even in digitally mature markets, mobile-first access and seamless availability remain central to shaping satisfaction (Saha et al., 2023). Order convenience proved a robust predictor, echoing Shankar et al. (2021), who found that reduced checkout friction and multiple payment options increase repeat purchases. Logistics and reverse logistics convenience emerged as the strongest driver overall, reinforcing insights from Vhatkar et al. (2024a), who emphasized the strategic role of last-mile and return logistics in sustaining competitive advantage. The regression results indicate that the full model explained 42.2% of the variance in customer satisfaction ($R^2 = .422$, Adjusted $R^2 = .418$). While moderate, this explanatory power is substantial in consumer research, where multiple psychological, situational, and contextual variables influence satisfaction. Similar ranges of explained variance (30%–45%) have been reported in omnichannel and digital service convenience studies (Cotarelo et al., 2021; Silva et al., 2024). Table 3 presents the regression findings, showing that four predictors (access convenience, search convenience, order convenience, and logistics/reverse logistics convenience) were statistically significant in the expected direction ($p < .05$), while evaluation convenience was not.

Table 3 Multiple regression results predicting Customer Satisfaction (N = 384)

Predictor (IV)	Standardized β	t	p	Significance
Access Convenience (AC)	0.15	2.55	0.011	*
Search Convenience (SC)	0.17	2.98	0.003	**
Evaluation Convenience (EC)	−0.10	−1.92	0.055	n.s.
Order Convenience (OC)	0.24	4.16	<0.001	**
Logistics/Reverse Logistics (LORLC)	0.22	4.06	<0.001	**

Model summary: $R^2 = .422$ (42.2%); Adjusted $R^2 = 0.418$; $F(5, 378) = 32.78$, $p < .001$

The non-significance of evaluation convenience is particularly noteworthy. In digitally advanced retail environments such as Malaysia, where most platforms already offer comprehensive product information, content richness may no longer differentiate satisfaction. Instead, tangible post-purchase aspects - delivery speed, real-time tracking, and simplified returns dominate customer evaluations. This finding supports the view that evaluation convenience now represents a "hygiene factor" rather than a source of competitive advantage. Conversely, logistics and reverse logistics stand out as pivotal determinants, echoing global research on the importance of last-mile and returns management in shaping customer trust (Ishfaq et al., 2024). Similarly, the strong influence of order convenience highlights the growing importance of seamless checkout and digital payment integration, particularly with the rise of BNPL options (Sharma & Fatima, 2024).

When compared to existing literature, the study's results align with Grewal et al. (2021) and Shankar et al. (2021), who emphasise the transformative role of digital technologies in shaping retail experiences, and with Gao et al. (2021), who underline the centrality of cross-channel integration. However, the findings diverge from those of

Hsu et al. (2024), who found that AR-based evaluation convenience significantly stimulated impulsive purchases, indicating that contextual and cultural differences may affect the salience of evaluation convenience. The novelty of this study lies in its comprehensive modelling of all five service convenience dimensions simultaneously, extending fragmented prior analyses (You et al., 2022; Riaz et al., 2022). In particular, the strong role of reverse logistics convenience highlights an underexplored determinant of satisfaction, with significant implications for retail management in Southeast Asia.

CONCLUSION AND IMPLICATIONS

Key Findings

This study investigated the role of digital transformation-enabled service convenience in shaping customer satisfaction among 384 Malaysian digital consumers. The findings demonstrate that access convenience, search convenience, order convenience, and logistics/reverse logistics convenience significantly and positively affect satisfaction, while evaluation convenience is non-significant. Among these, logistics/reverse logistics convenience was the strongest predictor, followed closely by order convenience. These results highlight that fulfillment reliability and transactional efficiency are the most decisive drivers of satisfaction, although ease of access continues to play an important role in the consumer journey. Importantly, the regression model explained 42.2% of the variance in satisfaction.

Theoretical Implications

This study contributes to service convenience theory by demonstrating that informational content - captured through evaluation convenience has evolved into a hygiene factor rather than a differentiator in digitally mature retail environments. While earlier research highlighted product information, reviews, and augmented reality tools as critical in shaping consumer confidence, the findings here suggest that such elements are now baseline expectations. In contrast, transactional and post-purchase touchpoints, particularly order processes and logistics/reverse logistics, emerge as more decisive in influencing customer satisfaction. These insights advance ongoing debates within omnichannel and digital commerce literature (Cotarelo et al., 2021; Tagashira, 2022; Silva et al., 2024), emphasizing that the relative salience of convenience dimensions is context-dependent rather than uniform. Moreover, the significant role of access convenience extends theoretical understanding by underscoring its persistent importance as the foundational gateway to digital retail experiences. Even as consumers become increasingly sophisticated, the ability to access platforms seamlessly through mobile-first design, fast-loading systems, and simplified authentication remains central to shaping positive perceptions. Collectively, these findings refine service convenience theory by highlighting a re-prioritization of dimensions in digital commerce and by confirming that pre-purchase, transactional, and post-purchase elements asymmetrically influence the customer journey.

Practical Implications

From a managerial perspective, this study provides a strategic roadmap for prioritizing digital transformation initiatives among Malaysian retailers. Strengthening logistics and reverse logistics capabilities should be the foremost priority, as speed, transparency, and ease of returns remain critical determinants of customer satisfaction and loyalty. At the transactional level, order processes must be streamlined by offering flexible payment solutions such as Buy Now Pay Later (BNPL) and digital wallets, which not only reduce friction but also align with evolving consumer payment preferences. Equally important is enhancing access convenience through mobile-first design, fast-loading platforms, and seamless login processes, ensuring that customers can engage with retail platforms anytime and anywhere. While search convenience tools, including filters, recommendation systems, and transparent pricing, serve as value enhancers, their role is complementary rather than foundational. Conversely, evaluation convenience, supported by reviews and augmented reality features, should be treated as a baseline service expectation rather than a source of competitive advantage. By aligning organizational resources with these priorities, retailers can not only achieve immediate improvements in customer satisfaction but also cultivate long-term loyalty in increasingly competitive omnichannel environments. This prioritization framework serves as a practical guide for managers seeking to balance operational efficiency with customer-centric innovation in the era of digital retailing.

Limitations

This study is subject to several limitations. First, the use of convenience sampling introduces potential selection bias, limiting the generalizability of results. Second, the study is geographically restricted to Malaysia, which may not capture regional or cultural variations across other markets. Third, reliance on cross-sectional, self-reported survey data prevents causal inference and may reflect perceptual rather than behavioral outcomes. Fourth, the sample skewed toward younger, digitally savvy consumers, potentially underrepresenting older cohorts. Finally, contextual variables such as product categories, brand trust, and economic conditions were not included, although these may shape perceptions of convenience and satisfaction.

Future Research

Future studies should address these limitations by employing probability-based sampling methods (e.g., stratified or random sampling) to increase generalizability. Cross-country studies across ASEAN and other emerging markets would allow validation of results in diverse contexts. Longitudinal designs could capture evolving expectations as technologies mature, while experimental methods could better establish causality. Additionally, integrating behavioral data (clickstreams, transaction logs) with perceptual measures would provide richer insights. Researchers should also investigate mediators such as trust and perceived value, as well as moderators like age, digital literacy, or product category, to refine our understanding of how digital convenience shapes satisfaction.

Ethical Considerations

This study involves voluntary participation, and the respondents agreed to take part in the study. Information gathered during this study is confidential.

Conflict of Interest

The authors declare that they have no conflict of interest.

ACKNOWLEDGEMENTS FUNDING

The authors acknowledge the support given by the Faculty of Industrial & Manufacturing Technology & Engineering and the Faculty of Technology Management & Technopreneurship Universiti Teknikal Malaysia Melaka, for the financial support and facilities provided in completing this research. The authors would like to thank the Centre of Smart Systems and Innovative Design (COSSID) and Centre of Technopreneurship Development (CTeD), UTeM, for their direct and indirect contributions.

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