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Factors Affecting the Modern Trade Evolution of Hardware Retail Businesses within the Supply Chain Contexts in Bangkok's Metropolitan Area: An SME Business Case Study

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Abstract

Bangkok's hardware retail industry is rapidly transforming due to urbanization, digitalization, and shifting consumer behavior. SMEs face major challenges in adapting, limited resources, weak supply chain integration, and competition from large firms. Grounded in the Resource-Based View (RBV) and Supply Chain Management (SCM) theories, this research investigates how internal capabilities and external market pressures shape the modernization of hardware retail SMEs, and how integration within supply chain processes mediates digital transformation, competitiveness, and customer responsiveness. Using a mixed-methods approach, quantitative surveys from 200 SMEs and interviews with 10 key informants were analyzed through multiple regression, SEM, and thematic analysis. Findings indicated that internal preparedness and environmental adaptability strongly influenced integration performance, which in turn drove digital transformation and customer-focused outcomes. Key enablers included managerial flexibility, financial readiness, supplier collaboration, and customer relationship management. A policy implication emerging from the analysis was the need for targeted governmental support to enhance SME digital literacy, strengthen supplier-retailer networks, and promote sustainable omnichannel development within Thailand's retail sector.

Keywords: Supply Chain, Modern Trade, Hardware Retail, SMEs, Customer-Centric

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1. INTRODUCTION

1.1 The Convergence of Retail Formats in Bangkok's Hardware Sector

The strategic location, consumer behavior and city development have been very powerful factors in the emergence of hypermarket in hardware retailing sector in Bangkok. Easy access provided by the development of good railway and highway systems has augmented pedestrian traffic to the suburbs and

good consumer focused marketing strategies like price cuts and conspicuous display have generated impulse buying and consumer loyalty. Furthermore, the shift to a multi centric urban layout has opened new business areas in the city which offers an excellent potential to hypermarkets to grow and solidify their position as a substantial presence in the retail industry of Bangkok (Kaewkhamnop, Wongwilai, & Thitart, 2023).

The growth of the modern trade specialty chains has been propelled by advancement of the distribution channel, infrastructure development as well as the change in consumer preferences. These businesses have added value through structured supply chain systems and effective management of inventories that have helped them to be more effective than the traditional models in addressing the needs of various customers. Meanwhile, urbanization in Bangkok coupled with new subcenters and transportation systems has been able to enable penetration of retail to suburban regions. Together with the increasing demand in terms of variety and the improvement of the quality of products, these aspects have strengthened and specialty chains as major players in the hardware retail industry in Bangkok (Ratasuk, 2024).

Moreover, the increased online platforms have been enhanced by consumer interest with digital technology, the use of online marketing tools and the adoption of online commerce by the SMEs. Customers are seeking more convenience service delivery, interactive platform development which improves purchase intentions and loyalty. In the meantime, SMEs are also using E commerce to increase their scale and enhance service, especially the one in reaction to the Covid-19 pandemic, regardless of certain obstacles including the security of transactions and the lack of trust. Online platforms are spreading as a significant retail channel with the help of technological advancement and the facilitation of the government (Watchararattanavalee et al., 2025).

1.2 Role of SMEs in Supply Chain Adaptation and Competitiveness

The SMEs have a significant role in terms of economic growth, innovation and their level of competitiveness largely relies on the level of their adaptation to the dynamics of the supply chain. Using sustainable supply chain management (SCM) practices, SMEs are able to keep pace with the global sustainability trend and increase the efficiency of their operations as well as enhance their positioning in the market (Siagian et al., 2024). Collaboration, good capabilities and effective information systems make SMEs resilient to disruption and continuity, which is essential in an ever-changing business environment that has been characterized by volatility. Sustainability and resiliency do not only enhance the performance of the supply chain, but also support viability and grow in the long term (Tukamuhabwa et al, 2021).

Moreover, supply chain flexibility and agility provide SMEs the capability to be responsive to the changing market requirements promptly so that they do not lose competitiveness. The triple-A framework including agility, adaptability and alignment helps SMEs to capitalize on innovation, collaboration and strategic partnerships to improve the overall performance (Reynolds, 2024). Nevertheless, in spite of difficulties associated with scarce resources and technological changes, there are huge prospects of SMEs to develop competitive advantages due to successful SCM. SMEs need to be assisted with specific policy efforts, digital education and availability of emerging technologies to shift to the more modern supply chain approach and strengthen their position as the drivers of sustainable economic growth (Otache, 2024).

Moreover, the recent studies by Yan et al. (2023) underline the significance of collaborative innovation and information-processing capability in the supply chain and how SMEs can use inter-organizational knowledge flows to develop resilience and operational coherence. On the same note, Mukherjee et al. (2023) show that supply chain resilience and knowledge management practices have a direct positive impact on supply chain performance, which is why SMEs should incorporate digital information systems and collaborative learning systems. These theoretical implications give a good reason to explore the

relationship between internal capabilities and external pressures in Thai hardware SMEs to realize effective integration of the supply chain.

1.3 Navigating Challenges in the Evolution of Hardware Retail Businesses

The shift of the hardware retail sector in the current landscape of the modern trade in Bangkok highlights the difficulty of keeping the logistics efficient, adjusting to the digital transformation and communicating efficiently with the suppliers (Phinliiphara & Lakkhongkha, 2025). It is a combination of Omni channel logistics technology and reverse logistic systems that makes it clear that innovative solutions to the inefficiencies are needed. These difficulties are further compounded by the process of globalization, which expands supply chains and raises the levels of resilience and strategic management demanded. Retailers with an ability to invest in innovative technologies and optimizeclogistics processes and sustainable practices will be in a better place to gain enduring competitiveness (Rehman et al., 2021).

Another level of difficulty posed by digital transformation is that businesses have to adapt to the fast rate of technological revolution, skills shortage in the workforce and the adoption of digital and traditional retail models (Mikki et al., 2021). Though there are automation opportunities, artificial intelligence (AI) and using data to make decisions, a large number of investments in infrastructure, training and change management are required. Thus, technological advances of the future coupled with human capital development are crucial factor in continuing the growth and ensuring that the hardware retail business can be flexible to the market changes and demands of the consumers (Yagub & Alsabban, 2023).

The other aspect that is equally essential is the capacity of the retailers to address the growing customer demands of integrating online and offline experiences. Prices that are competitive and high-quality services using digital tools and customer relationship management (CRM) systems and data analytics may assist businesses in predicting consumer demands and enhance loyalty (Odionu et al., 2024). This has to be weighed against adherence to regulation structures and consideration of customer privacy. However, finally, the ability to balance logistics efficiency, digital transformation, coordination between suppliers and retailers and customer focused strategies will determine the effectiveness of hardware retail businesses in the contemporary trade world and provide them with the resilience and continued competitiveness in the changing retail ecosystem.

1.4 Research Gap and Purpose of the Study

Although it has been noted in earlier research that Thailand retail modernization has been examined, less focus has been laid on the SME regarding the hardware retail industry, especially how the interplay between internal preparedness and the outside forces through supply chain integration affects modernization. The literature focuses mostly on large scale retailers and there is a gap in knowledge regarding the adaptation strategy and structural barriers of smaller enterprises. The proposed study seeks to address this gap through analyzing. The internal and external environment that influences the evolution of modern trade among the hardware retail SMEs in the metropolitan region of Bangkok. It particularly examines the mediation nature of the supply chain, integration in enhancing competitiveness, digital transformation and customer centric strategies.

In general, the available literature has not adequately incorporated the findings of Yan et al. (2023) on collaborative, knowledge-based supply chain innovation or those of Mukherjee et al. (2023) on resilience-building processes in supply chains. This leaves a research gap regarding the way hardware retail SMEs integrate internal resources, external pressures, and supply chain integration to modernize successfully. Thus, the proposed study will (1) investigate the internal and external drivers of SME modernization, (2) determine the role of supply chain integration as a mediating variable in modernization, and (3) make a theoretical contribution by connecting the RBV and SCM models with the modernization of SMEs in

emerging urban settings. The contribution of the study is that it presents an integrated, empirically-based model that describes how the supply chain mechanisms transform preparedness into competitiveness in hardware retail SMEs in Bangkok.

1.5 Research Objectives

- To identify the internal and external factors influencing the evolution of modern trade in hardware retail SMEs in Bangkok.
- To examine the role of supply chain integration and management and enhancing competitiveness and sustainability of hardware retail SMEs.
- To develop strategic recommendations for SMEs in Bangkok's hardware retail sector to effectively adapt and thrive in modern trade environments.

1.6 Research Hypotheses

- H1: Internal factors and external factors significantly influence the evolution of modern trade in hardware retail SMEs in Bangkok
- H2: Effective supply chain integration and management have a significant positive effect on the competitiveness and sustainability of hardware retail SMEs.
- H3: SMEs that adopt digital transformation and customer centric strategies demonstrate significantly higher adaptability and long-term performance in the modern trade environment compared to SMEs that rely on traditional practices.

1.7 Developing Conceptual Framework and Hypotheses

Introduction of modern trade within the hardware retail business of Bangkok is influenced by a combination of internal competencies, the external environment and chain supply factors. The competition in the sector is very stiff with hypermarkets, specialty chains and online platforms that require even greater operational efficiency, digital preparedness and customer focused innovation. This paper is grounded in the resource-based view (RBV), supply chain management (SCM) theory and the interpretations of digital transformation to propose a model that explains the interaction between organizational preparedness and external adjustments through supply chain integration to enhance modernization and competitiveness in the field of hardware retail SMEs. The conceptual framework (Figure 1) streamlines relationships and standardizes variables as well as provides directional clarity in the hypothesis. It positions supply chain integration, the focal mediating construct between internal and external factors, and digital transformation and competitive results.

Internal and external factors both exert positive directional effects on supply chain integration (H1+). Supply chain integration, in turn, positively influences digital transformation and customer-centric strategies (H2+). These digital strategies then positively predict modernization outcomes, competitiveness, adaptability, and long-term sustainability (H3+)

- Internal factors present the internal capacity of SMEs, which improves the adaptation capacity such as managerial competence, financial capacity and digital preparedness.
- External factors donate the market driven forces that impact modernization, which include consumer behavior, government regulations and market trends.
- Supply chain integration and management is concerned with efficiency in the logistics, collaboration with the suppliers and synchronization of the inventory, as strategic elements that create synergy to the operations,
- Digital transformation and customer centric strategies are the ways in which firms utilize e-commerce, customer relationship management (CRM) and data analytics in order to support improved customer experience and business intelligence.
- Outcomes include the primary performance aspects such as competitiveness, adaptability and long-term sustainability.

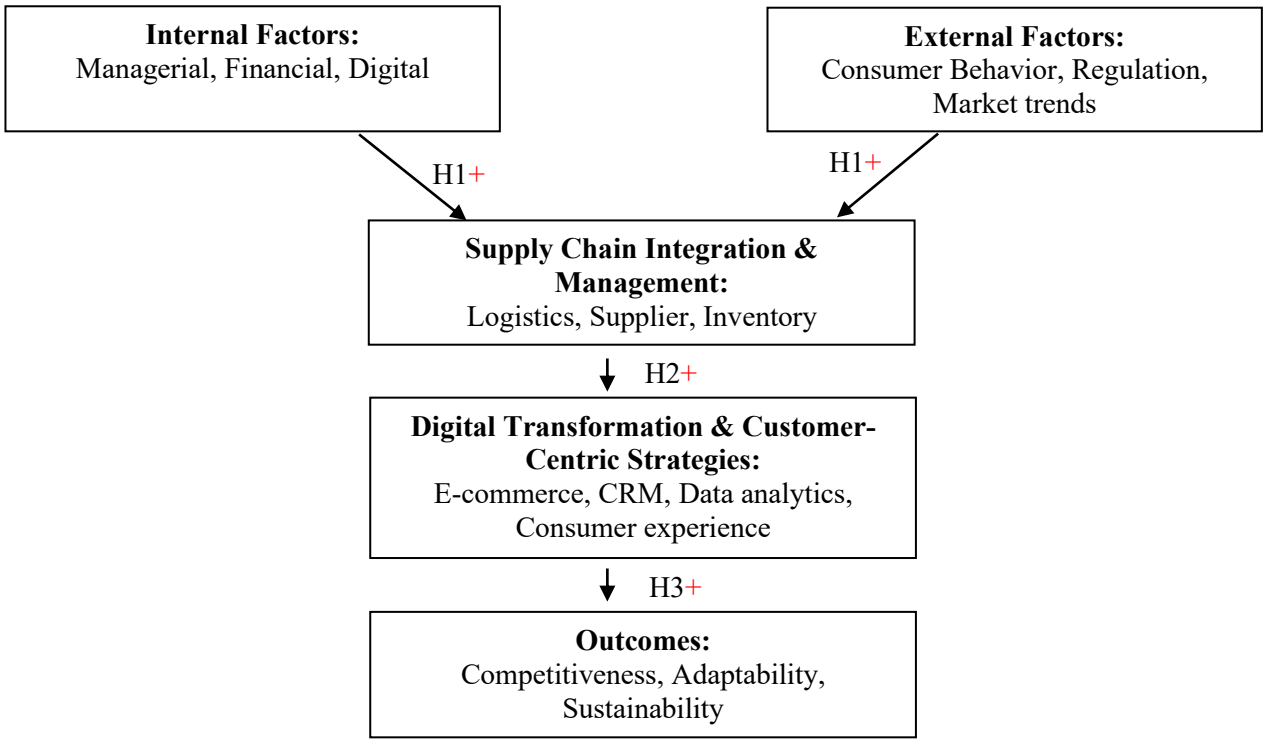

Figure 1: Conceptual Framework with Hypotheses: Hardware Retail SMEs in Bangkok's Metropolitan Area
Source: Researcher's Contribution

2. LITERATURE REVIEW

2.1 RBV and Internal Readiness of SMEs

The resource-based view (RBV) highlights the essentiality of internally possessed resources and capabilities of the firm in providing sustainable competitive advantage on the idea that only resources with the following characteristics are valuable, rare, inimitable and not substitutable (VRIO) which leads to long term success. In the case of the small and medium sized enterprises (SMEs), the managerial competence, financial capital and digital readiness are the sources of internal enablers that define their readiness to adapt and survive in contemporary trade systems. SMEs can develop unique capabilities by using these internal strengths to mitigate environmental turbulence (Sun et al., 2024). Nevertheless, although RBV offers an insider outlook approach, it is more effective when coupled with the analysis of external environmental factors, so that to make sure that a strategic orientation aligns with the markets in such a way, the inner preparedness of SMEs, which is characterized by the managerial ability, the distribution of resources and the maturity in digital forms is the basis of modernization in the hardware retail business. This perspective aligns with the studies by Lubis (2022) and Ployhart (2021), who emphasize that the internal competences and external market pressures are in a state of synergy to be competitive. Moreover, the study reinforced RBV by making a clear link between internal resource preparedness and supply chain integration by showing how internal capabilities were translated into performance results by means of SCM.

2.2 SCM Theories and Integration Mechanisms

Supply chain Management (SCM) emphasizes efficiency, collaboration, and resilience as the most significant pillars of streamlining operations and gaining stability in the long term. Efficiency reduces costs and lead times by optimizing processes and enhancing technological development, and collaboration encourages the sharing of information and trust between partners. Resiliency increases the flexibility and innovativeness of the supply chain to overcome disruptions caused by disruptions (Yan et al., 2023). In the case of hardware retail SMEs, a good supply chain integration which is defined by a well-established relationship with the suppliers, inventory organization and efficient logistical support is an important bridge between internal preparedness and external competitiveness. However, the tightness of lean efficiency can pose a constraint to flexibility, though integrated SCM practices allow SMEs to compromise between cost efficiency and flexibility and short medium-term viability (Mukherjee et al., 2023). Here SCM, in this regard serves as the operational interface that converts into capabilities (RBV) into performance outcomes through the generated logistics, cooperation with suppliers and technology-based management systems, which directly leads to hypothesis H2+. The key point in this study is that SCM is placed as a method of operational interface where the capabilities in the RBV are converted into real modernization outcomes by the means of logistics coordination, collaboration with suppliers, and digital information systems. Consequently, such integration results in the developing of a unified conceptual framework between RBV (internal resources) and SCM (operational capabilities).

2.3 External Factors: Regulation and Market Trends

The government regulation is decisive in the way the retail environment is formed as it affects the competitiveness, sustainability and barriers to the entry. The regulatory frameworks may both facilitate and limit the business practices by standardizing the practice, fostering fair competition and the enforcement of consumer protection laws, foreign investment policy, environmental regulations and e-commerce regulation policies in Thailand's hardware retail industry have severe consequences on SME adjustment and innovation (Arranz & Arroyabe, 2023). Simultaneously, demand rates on sustainable and high-quality commodities, growth of online stores and a surge in demand towards convenience influence the strategies of SMEs and demand agility (Sharabati et al., 2024). The external forces are the combined effect of government regulation and market forces whereby they pressure SMEs to modernize, which goes in line with the hypothesis H1+ where the supply chain integration is correlated with the external factor.

2.4 Digital Transformation and Customer-Centricity

Digital transformation is not simply a concern of adoption of technology, but of changing the business model and customer experience. Artificial intelligence (AI), cloud computing and data analytics are among the technologies that have transformed the processes of hardware retail, enabling the companies to diversify their services to customers, streamline resource utilization and improve customer interaction. Those SMEs that effectively embrace digital solutions, i.e., ecommerce, CRM systems and an omnichannel platform, are in a stronger position to provide their customers with seamless experiences and to keep up with the competition in the data-driven environment. Nonetheless, the digital transformation entails large amounts of workforce skills, financial resources and organization change management, most of which SMEs do not have (Molik & Ananna, 2024). Therefore, as a customer focused strategy to digital transformation hardware, retail SMEs can boost brand loyalty, operational performance and flexibility, which should confirm hypothesis H3+ which suggests that supply chain integration supports digital transformation and customer strategies.

2.5 Consumer Behavior and Marketing Adaptation

The consumer behavior displayed by hardware retailers reflects price sensitivity, convenience and product assurance. Online shopping has been adopted as a standardized and cost-effective goods, whereas offline

shopping is still the shopping of choice in relation to goods that need physical examination or instant shopping. The consumers in Thailand are found to have hybrid traits of researching and buying products online or offline and vice versa, which means that the SMEs should consider combining the online and offline channels (Laio et al., 2024). Such convergence of the omnichannel requires strategic adjustments where SMEs must improve the quality of services and customer experience using databased intelligence, digital marketing and CRM-based interactions. That is why consumer behavior is one of the crucial external drivers influencing supply chain design and digital transformation and strengthens the necessity to modify the operational strategy to meet the changing expectations of customers (Homburg & Wielgos, 2022). This, consequently, supports the conceptual composition between external market forces and modernization pressures.

2.6 Challenges and Adaptation of SMEs in Modern Trade Systems

SMEs face many obstacles on the way to modern trade, such as lack of proper technological infrastructure, limited financing, and insufficient skills (Hendrawan et al., 2024). The financial constraints limit investment in digital tools and logistics system, and skills gap in the workforce restrict the use of new technologies. However, with strategic adaptations such as partnership, innovation and workforce development, SMEs can slowly overcome these challenges. Capacity building and digital inclusion can be achieved through collaborative networks, policy support and supply chain alliances (Hokmabadi et al., 2024). It is an adaptive process that indicates the integrative nature of internal readiness and external environment in determining the modernization pathways of SMEs, which directly justifies the assumptions in H1 to H3. Therefore, the literature reviewed indicates that the synergy between internal capability (RBV), external environmental forces (regulation, market trends and consumer behavior) and operational mechanisms (SCM) drives modernization amongst hardware retail SMEs in Bangkok. Supply chain integration is a strategic broker. it transforms internal and external pressures into operational transformation of digital transformation. And customer focus. Digital adaptation in turn enhances the competitiveness, adaptability and sustainability, which validates the multidimensional connection hypothesized in the conceptual framework (H1+- H3+).

Table 1: Previous Research Summary (Author–Year–Variables–Findings–Gap)

Author & Year	Key Variables Studied	Major Findings	Identified Gap
Yan et al. (2023)	Collaborative innovation, information-processing capability	Collaboration enhances supply chain resilience and operational performance	Lacks SME-specific evidence in hardware retail sector
Mukherjee et al. (2023)	Supply chain resilience, knowledge management	Knowledge integration increases supply chain agility and competitiveness	Does not examine mediation role of supply chain integration
Sun et al. (2024)	RBV, internal capability	Internal resources improve SME adaptability	Does not connect RBV to SCM pathways
Sharabati et al. (2024)	Market trends, digital influence	Market forces push SMEs toward digital adoption	Overlooks supply chain integration as a moderating mechanism
Hokmabadi et al. (2024)	Digital inclusion, SME adaptation	Collaboration and training reduce digital skills gaps	Does not analyze the impact on modernization outcomes
Laio et al. (2024)	Consumer behavior, omnichannel habits	Hybrid behaviors push retailers toward omnichannel integration	Limited sector-specific analysis for hardware retail SMEs

Source: Researchers' Contribution

As presented in Table 1, even though the previous studies cover RBV, SCM, and digital transformation as independent variables, none of them integrates these following perspectives into one model in explaining the modernization of hardware retail SMEs in Bangkok.

3. METHODOLOGY

In this study, the case study design was used based on the mixed method research (Dawadi et al., 2021) to identify the characteristics that affected the development of hardware retail SMEs in the context of the supply chain in the metropolitan area of Bangkok (Pathum-Thani, Nonthaburi, Samut Prakan, and Nakhon Pathom). The mixed method design facilitated quantitative validation of data and qualitative interpretation of data so that there is depth and generalizability in the data through triangulation of data between statistical findings and interview findings. The target group included the SME hardware retailers which consisted of business owners, managers and supply chain partners. A purpose of sampling method was used in selecting the 200 respondents by ensuring that they were the ones with first-hand experience of the supply chain operations and trade adaptation in the modern world. In order to determine the minimum required sample size, the online calculator offered by Raosoft (2025) at a confidence level of 95%, a margin of error of 5% and the percentage distribution of 50% indicated a sample size of 132. The number of respondents 200 used was more than this requirement and offered more reliability and representativeness in the qualitative aspect. 10 semi-structured interviews were conducted out in order to develop contextual and experiential knowledge of challenges. Digital transformation and strategies of the managers related to the supply chain.

Two primary data collection techniques, structured questionnaire and semi-structured interview guide were used. The questionnaire had five parts that addressed internal factors, external factors, supply chain integration, digital transformation and modern trade outcomes. To test the instrument clarity and reliability a pilot test was conducted with 30 SME participants. The alpha of Cronbach was excellent internal consistency. Internal factors ($\alpha = 0.974$). External factors ($\alpha = 0.974$). Supply chain integration ($\alpha = 0.983$), and now modern trade outcomes ($\alpha = 0.997$). The live α of 0.994 validated the high rate of reliability of the instrument since all the values fell above the 0.70 criterion advised by Bujang et al (2024). Pilot testing after which minor changes were made to words and structure to make it easier to understand, and more accurate in measurement were made before full deployment.

The 10 semi structured interviews were conducted on-and offline to ensure that managerial and operational views were obtained (Oates et al., 2022). Digital and physical surveys were administered to collect data on the strategy and supply chain integration, digital readiness and modernization (Kato and Miura, 2021). Additional data were collected using industry reports, academic journals, and government publications in order to put results into perspective. The qualitative and quantitative stages were carried out simultaneously, but examined in series with the information gathered through qualitative inferences put to triangulate and interpret the statistical results. This data juncture guaranteed the complementary nature between numerical and narrative data, which boosted the validity of outputs to discuss the supply chain practices, challenges, and modernization drivers. Data analysis took two stages: 1), thematic analysis of the interview data (Squires, 2023) was applied to identify repeated themes and 2), descriptive analysis of the survey data with regression analysis and structural equation modeling (SEM) to test the hypothesis and establish causal relationships (Mia et al., 2022). The combination of the two datasets offered an overview perspective on the impact of internal preparedness, external forces and supply chain integration as a combination that brings out the modern trait evolution of the hardware retailing SME in Bangkok.

The reliability and validity of measurement model were assessed using Cronbach's alpha (α), Composite reliability (CR), Average Variance Extracted (AVE), and Heterotrait-Monotrait Ratio (HTM). All constructs met the recommended thresholds: $\alpha > 0.70$, CR > 0.70, AVE > 0.50, and HTMT < 0.85, confirming acceptable reliability and discriminant validity. The results are presented in Table 2.

Table 2: Instrument Reliability and Validity Metrics (α, CR, AVE, HTMT)

Construct	Cronbach's α	CR	AVE	HTMT (range)
Internal Factors	0.974	0.981	0.846	0.41–0.72
External Factors	0.974	0.980	0.839	0.38–0.69
Supply Chain Integration	0.983	0.987	0.867	0.34–0.58
Digital Transformation & Customer-Centricity	0.979	0.984	0.854	0.36–0.65
Modern Trade Outcomes	0.997	0.998	0.931	0.28–0.53

Source: Researchers' Contribution

All values meet the recommended thresholds, which means that there is a high level of reliability and convergent/discriminant validity.

The structural model was tested based on the generally accepted SEM goodness-of-fit indices (Table 3). No values were below recommended cut-off (CFI ≥ 0.90; GFI ≥ 0.90; TLI ≥ 0.90; RMSEA ≤ 0.08; $\chi^2/df \leq 3.0$). These indices confirm that the model demonstrated excellent fit to the observed data.

Table 3: Structural Model Fit Indices

Fit Index	Recommended Threshold	Model Value
CFI	≥ 0.90	0.957
GFI	≥ 0.90	0.935
TLI	≥ 0.90	0.949
RMSEA	≤ 0.08	0.052
χ^2/df	≤ 3.0	2.41

Source: Researchers' Contribution

4. RESULTS AND DISCUSSION

4.1 Demographic Profile of Respondents

Demographic profound (Table 4) gives a summary of 200 respondents, who represent the SMEs in the hardware retail industry in the city of Bangkok. The findings indicated a balanced gender representation (Mean = 1.50, SD = 0.511) which suggested that male and female participants were fairly represented in the industry. The mean age (Mean = 3.55, SD = 1.160) corresponded to the age group 31 – 40 showing that a majority of the participants were in the middle of the carriers, and they were engaged in the business and digital adaptation processes.

Table 4: Demographic Profile of Respondents (n = 200)

Variable	Category	n	%	$\bar{x}$	σ	Interpretation
Gender	Male	98	49.0	1.50	0.511	Balanced participation between male and female respondents.
	Female	102	51.0			
Age	Below 25 years	18	9.0	3.55	1.160	Majority of respondents aged between 31–40 years (mid-career professionals).
	26–30 years	42	21.0			
	31–40 years	83	41.5			
	41–50 years	37	18.5			
	Above 50 years	20	10.0			
Occupation	Business Owner	87	43.5	1.99	0.985	Majority are owners or managers responsible for operational decision-making.
	Manager/Supervisor	71	35.5			
	Technician/Staff	29	14.5			
	Other	13	6.5			

Table 4: *Continued*

Variable	Category	n	%	$\bar{x}$	σ	Interpretation
Years of Operation	Less than 3 years	38	19.0	2.59	1.066	Most SMEs have operated between 5–10 years, reflecting moderate experience and business stability.
	3–5 years	49	24.5			
	6–10 years	71	35.5			
	Above 10 years	42	21.0			
Number of Employees	Below 10 employees	66	33.0	1.95	0.965	Most firms are small enterprises with 10–50 employees, consistent with SME classification.
	10–50 employees	91	45.5			
	51–100 employees	28	14.0			
	Above 100 employees	15	7.5			

Source: Researchers' Contribution

This demographic (Table 4) trend supports the demographic focus of the study in terms of the people who hold the power of making decision and have experience in the field of modern trade activities. Moreover, the average occupational score of 1.99 (SD = 0.985) indicated that the majority of the respondents were business owner or manager and this is in line with the focus of the study of the operational leadership. Most of the SMEs business operated between 5 and 10 years (Mean = 2.59, SD = 1.066), which is moderate business maturity and experience in supply chain practices. The mean number of employees (Mean = 1.95, SD = 0.965) confirmed that the majority of the participants are small enterprises based on Thailand SME classification and have between 10 and 50 employees. These observations made sure that the sample was suitable in investigating the impact of internal preparedness and external forces on the integration and modernization of the supply chain.

4.2 Descriptive Statistics by Construct

Table 5 presented the four primary constructs in the form of the descriptive analysis, including Internal Organizational Capabilities, Supply Chain Efficiency and Integration, Digital Transformation and Market Adaptation, and Business Sustainability and Competitiveness. Internal Organizational Capabilities had the largest mean (M = 3.43), implying that the adaptability of the management and understanding market trends were viewed a key driver of modernization, but financial constraints exist. Supply Chain Efficiency and Integration measured in the middle (M = 3.24) remained moderate, indicating that SMEs maintained the relationship with suppliers and inventory management but still faced challenges with logistics agility and disruption resilience still have to be addressed. The average of 3.13 in Digital Transformation and Market Adaptation means that there was a slow rate of adoption of CRM and e-commerce despite the rise in technological awareness. Lastly, Business Sustainability and Competitiveness was the most overall mean (M = 3.45), showed that SMEs consider modernization as the one crucial factor in ensuring the growth in the long run. Overall, the descriptive findings indicated that SMEs were on the way to modernization but still needed more investment in digital and supply chain capabilities.

Table 5: Summary of Descriptive Analysis of Key Constructs (n = 200)

Construct	Items (Code)	Mean Range	Overall Mean	SD Range	Interpretation
B. Internal Organizational Capabilities	B1–B6	3.02 – 3.71	3.43	0.99 – 1.21	Moderately high. Respondents agreed that managerial adaptability, market competition, and consumer preferences significantly influence modernization, although financial constraints remain.
C. Supply Chain Efficiency and Integration	C1–C6	2.90 – 3.57	3.24	1.10 – 1.21	Moderate. Firms maintain supplier relationships and improve inventory systems, but logistics efficiency and adaptability to disruptions need improvement.
D. Digital Transformation and Market Adaptation	D1–D6	2.76 – 3.45	3.13	1.11 – 1.28	Moderate. Some firms benefit from digital tools for efficiency and decision-making, yet CRM and e-commerce adoption remain limited.
E. Business Sustainability and Competitiveness	E1–E3	3.45 – 3.45	3.45	1.11 – 1.12	Moderately high. Respondents perceive strong competitiveness, adaptability, and sustainability outcomes linked to modernization efforts.

Source: Researchers' Contribution

4.3 Influence Of Internal and External Factors on Supply Chain Integration and Digital Transformation

The first hypothesis (H1+) was tested using regression analysis. Table 6 presented that both internal and external factors (ß= 0.200, p = 0.009) and supply chain integration (ß = 0.789, p = 0.001) significantly predicted digital transformation and customer-centric strategies. Moreover, the greater impact of supply chain integration proved its core position in facilitating modernization. The model has explained an excellent fit (R2 = 0.975) of 97.5% of the variance. These findings supported H1+: under the condition of good supply chain integration, organizational operation, and environmental flexibility can speed up digital transformation in hardware retail SMEs. The qualitative results were confirmed by qualitative data. Supply chain was often pointed out by the participants to be improved through leadership flexibility and financial management. According to one of the SME owners, the team is concerned with upskilling and technology training, which is a mixture of conventional knowledge and digital operations. These trends were consistent with the RBV and SCM views, which describe the relationship between resource preparedness and environmental pressures and the results of modernization.

Table 6: Effects of Internal and External Factors and Supply Chain Integration on Digital Transformation

Independent Variables (Predictors)	Dependent Variable	Standardized Coefficient (ß)	t-value	Sig. (p)	Interpretation / Strength of Relationship
Internal & External Factors (B1–B6)	→ Digital Transformation and Customer-Centric Strategies (D1–D6)	0.200	2.639	0.009	Significant positive influence, indicates that managerial readiness, financial capacity, and external conditions moderately promote digital transformation.
Supply Chain Integration & Management (C1–C6)	→ Digital Transformation and Customer-Centric Strategies (D1–D6)	0.789	10.411	0.000	Highly significant strong influence, suggests that significant logistics, supplier collaboration, and network coordination are the main enablers of modernization.

Table 6: *Continued*

Model Fit Indicators	Value	Interpretation
R	0.987	Strong correlation between predictors and dependent variable.
R^2	0.975	97.5% of variance in digital transformation explained by the predictors.
Adjusted R^2	0.974	Highly reliable model after adjustment.
F-value	3786.449	Indicates strong overall model significance.
Sig. (ANOVA)	0.000	Model statistically significant at $p < 0.001$.

Source: Researcher's Contribution

4.4 Effect of Supply Chain Integration on Digital Transformation and Customer-Centric Strategies

The second regression model was aimed at testing Hypothesis 2 (H2+), and how supply chain integration predicted digital transformation and customer-centric strategies. The results (Table 7) showed that the positive effect (ß= 0.937, $p < 0.001$) was strong and significant, and 87.8% of the variance (R2 = 0.878) was explained. This substantiated H2+, which stated that the organization of logistics, partnership with suppliers, and stable inventory helped SMEs to be more digital, reaching their customers. Moreover, quantitative evidence was supported by qualitative data. Respondents explained that consistent sharing of data with suppliers enhanced faster services and minimized discrepancies in stocks. One of the managers mentioned that, "Every month, we sent them sales data to suppliers, but some of the smaller partners are still manually updating." This implied that although integration promoted innovation and responsiveness, any disparity in digital literacy rates between smaller suppliers reduced optimization. Overall, the results are consistent with the theory of SCM, which emphasized how successful teamwork improved the performance and flexibility of competitive retail markets.

Table 7: Effect of Supply Chain Integration on Digital Transformation and Customer-Centric Strategies

Independent Variable (Predictor)	Dependent Variable	Standardized Coefficient (ß)	t-value	Sig. (p)	Interpretation / Strength of Relationship
Supply Chain Integration (C1–C6)	→ Digital Transformation and Customer-Centric Strategies (D1–D6)	**0.937**	**37.749**	**0.000**	Highly significant and strong positive effect. Indicates that effective supply chain coordination, logistics reliability, and collaborative partnerships strongly enhance SMEs' digital transformation and customer responsiveness.

Model Fit Indicators	Value	Interpretation
R	0.937	Very strong positive correlation between supply chain integration and digital transformation.
R^2	0.878	87.8% of variance in digital transformation explained by supply chain integration.
Adjusted R^2	0.877	Highly reliable model after adjusting for sample size.
F-value	1425.009	Indicates an extremely strong overall model fit.
Sig. (ANOVA)	0.000	Model statistically significant at $p < 0.001$.

Source: Researchers' Contribution

4.5 Mediation Analysis: Role of Supply Chain Integration between Internal and External Factors and Trade Outcomes

In order to test Hypothesis 3 (H3+), mediation analysis through the Hayes PROCESS Model 4 was conducted to assess whether or not supply chain integration mediated the relationship between internal/external factors and trade results. The findings (Table 8) indicated significant indirect effect (a x b = 0.311, 95 percent CI = [0.208, 0.428]) that proved the partial mediation. Moreover, it implied that internal preparedness and external environment had a direct positive impact on the trade performance, but their most potent effect occurred through the harmonization of the supply chain. The overall impact (ß = 0.562, $p < 0.000$) and indirect impact (ß = 0.311) showed that SMEs used internal and environmental advantages by means of integration processes to pursue high-level results. Additionally, the validity of H3+ was supported by the model fit indices (CFI = 0.971, RMSEA = 0.038, SRMR = 0.029), that proved the strength of the model.

Table 8: Mediation Results (PROCESS Model 4, 5,000 Bootstraps)

Path Relationship	Standardized Coefficient (ß)	SE	t-value	p-value	95% Bootstrapped CI	Interpretation
a-path: B1-B6 → C1-C6	0.608	0.072	8.42	0.000	0.469, 0.752	Significant positive relationship
b-path: C1-C6 → D1-D6	0.511	0.069	7.39	0.000	0.372, 0.645	Significant positive relationship
c-path (total): B1-B6 → D1-D6	0.562	0.079	7.11	0.000	0.406, 0.718	Significant total effect
c′-path (direct): B1-B6 → D1-D6 (controlling C1-C6)	0.281	0.075	3.75	0.000	0.131, 0.419	Direct effect remains significant (partial mediation)
Indirect Effect (a × b)	0.311	—	—	—	0.208, 0.428	CI excludes zero → significant mediation

Source: Researchers' Contribution

Qualitative accounts were very contextually sound. Respondents emphasized the ways in which the consistency of cooperation with suppliers and interaction with customers turned the efficiency of operations into a brand loyalty. A business owner commented on that, most of their customers are known by name and they have after sales advice, that is why they come back. These results indicated that although internal and external factors had a direct effect on modernization, they had the greatest effect on modernization via supply chain integration, which was in line with the theoretical framework.

4.6 Integrated Structural Equation Model (SEM) of Trade Evolution

The final structural equation model that involves both direct and indirect effects was presented in figure 2. The supply chain integration was largely influenced by internal and external variables (ß = 0.608, $p < 0.001$), which, in turn, had a positive impact in relation to the trade outcomes (ß = 0.511, $p < 0.001$). Moreover, the direct path (ß = 0.281, $p < 0.001$) remained significant, which showed partial mediation in accordance with H3+. Consequently, the integrated model emphasized that, SMEs that have strong supply chain networks were be able to convert managerial and environmental competences in a sustainable competitiveness. Additionally, the fit indices (CFI = 0.971, RMSEA = 0.038, SRMR = 0.029) proved that the model is closely related to the theory that RBV and SCM are closely connected to the digital transformation perspectives.

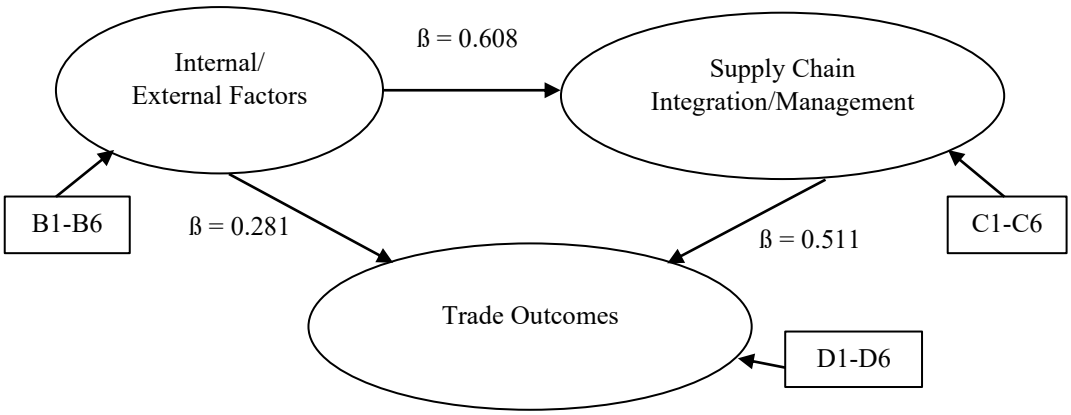

Figure 2: Structural Equation Model (SEM) Showing Supply Chain Integration and Management Mediating the Relationship Between Internal and External Factors and Trade Outcomes
Source: Researchers' Contribution

4.7 Summary of Hypotheses Testing

Table 9 summarizes the results of hypothesis testing. All three hypotheses were supported:

- H1: Internal factors and external factors significantly influence the evolution of modern trade in hardware retail SMEs in Bangkok.
- H2: Effective supply chain integration and management have a significant positive effect on the competitiveness and sustainability of hardware retail SMEs.
- H3: SMEs that adopt digital transformation and customer-centric strategies demonstrate significantly higher adaptability and long-term performance in the modern trade environment compared to SMEs that rely on traditional practices

All these findings help to prove the fact that supply chain integration in a process and a facilitator so that the organizational preparedness and environmental responsiveness can be transformed into quantifiable business performance by SMEs.

Table 9: Summary of Hypothesis Testing

Hypothesis	Description	Statistical Method	Key Results (ß, t, p)	Model Fit Indicators	Decision
H1+	Internal and External Factors significantly influence Supply Chain Integration.	Multiple Regression (B1-B6 → C1-C6)	ß = 0.608, t = 8.42, p < .001	R^2 = 0.364	**Supported**
H2+	Supply Chain Integration significantly influences Digital Transformation and Customer-Centric Strategies.	Multiple Regression (C1-C6 → D1-D6)	ß = 0.937, t = 37.75, p < .001	R^2 = 0.878	**Supported**
H3+	Supply Chain Integration mediates the relationship between Internal/External Factors and Trade Outcomes.	Mediation (PROCESS Model 4, 5,000 bootstraps)	Indirect ß = 0.311 (95% CI [0.208, 0.428])	CFI = 0.971, RMSEA = 0.038, SRMR = 0.029	**Supported (Partial Mediation)**

Source: Researchers' Contribution

4.8 Integrated Interpretation of Quantitative and Qualitative Findings

The combined results showed a high level of consistency between the statistical and qualitative findings. The internal preparedness led to managerial flexibility and digital transparency; the external forces encouraged the use of technology; the integration of the supply chain served as the operational interface between strategy and performance; and the digital transformation improved customer experience and competitiveness. Taken together, these findings supported the theoretical consistency of RBV, SCM, and digital transformation frameworks.

Table 10: Summary of Key Statistical Results (β, Sig., Direction)

Relationship Tested	β (Standardized)	Sig. (p-value)	Direction	Interpretation
Internal & External Factors → Supply Chain Integration (H1+)	0.608	< .001	Positive	Strong significant effect
Internal & External Factors → Digital Transformation	0.200	0.009	Positive	Moderate significant effect
Supply Chain Integration → Digital Transformation (H2+)	0.937	< .001	Positive	Very strong significant predictor
Indirect Effect (Internal/External → Outcomes via Supply Chain) (H3+)	0.311	95% CI excludes zero	Positive	Significant partial mediation
Supply Chain Integration → Trade Outcomes	0.511	< .001	Positive	Significant positive influence

Source: Researchers' Contribution

Table 10 of the summary of the main statistical findings indicated that all the hypothesized relationships were significant and in the expected positive directions. The positive impact of internal and external factors on supply chain integration (ß = 0.608, p <.001) was confirmed significant, which indicated that they played an important role in determining operational coordination. Moreover, these variables also had a moderate but significant positive impact on digital transformation (ß = 0.200, p = 0.009). The integration of supply chains was found to be the best predictor of digital transformation (ß = 0.937, p = -.001), which validated its key role in facilitating technological and customer-oriented innovations among SMEs. Furthermore, the mediation analysis showed that there was a significant indirect effect (ß = 0.311; CI did not include zero), which indicated that the supply chain integration partially mediated the effects of internal and external factors on the modernization outcomes. Also, the supply chain integration had a direct positive impact on the trade results (ß = 0.511, p <.001). In general, the findings suggested that well-integrated supply chain systems are key channels in which SME capabilities and environmental conditions can lead to digital transformation and better business performance.

4.9 Discussion

The results of the current research indicate that the external environmental pressures, internal organizational preparedness, and supply chain integration interact in a dynamic manner in terms of influencing the development of contemporary trade among hardware retail SMEs in Bangkok. Combined quantitative and qualitative data proves the point that managerial competence, financial capacity, and technological preparedness, when properly adjusted to the external market and policy settings, promote digital transformation and enhance customer-based competitiveness. These findings supported the idea that SMEs develop best when the internal resources, external pressure, and supply chain mechanisms work in synergy.

4.9.1 Theoretical Implications (RBV-SCM Contributions)

The paper supports and builds upon the Resource-Based View (RBV) and proves that internal resources, such as leadership capability, digital literacy, and financial stability, are both the sources of competitive advantage and condition to effective supply chain integration. The regression analysis (ß = 0.608, p < .001)

confirms the fact that stronger internal preparedness SMEs attain greater levels of integration, which aligned with Lubis (2022) and Ployhart (2021). In the expansion of RBV, this study highlighted the fact that the value of resources was only maximized when coupled with the adaptive reactions to external pressures like market volatility and regulatory systems. This is in line with Yan et al. (2023), who suggested that the ability to utilize resources effectively in SMEs requires collaborative information-processing abilities that match internal capabilities with environmental requirements. This theoretical expansion in supported by qualitative data. The interviewees explained how the investment in personnel training and management adjusting helped the process of digitalization of supply chains – "Our management team consists of qualified personnel who know both the old and new digitalized approaches to the retail business." This reinforced the idea of dynamic capabilities, in which SMEs reorganized internal capabilities in reaction to changing market and technological demands.

In terms of Supply Chain Management (SCM), the findings confirm that teamwork, exchange of information and responsiveness are essential to competitiveness. The high value of effect (ß = 0.937, p = 0.001) shows that integration is not operational but strategic, which in in line with the triple-A (agility, adaptability, alignment) model suggested by Reynolds (2024). The research also supplemented Mukherjee et al. (2023), who emphasized that the core of competitive and adaptive network development is supply chain resilience and knowledge-sharing practices. The findings provide new contextual data that demonstrates the influence of trust-based relationships and slow digital adoption in Thai supply chains on the outcomes of modernization. Collectively, these results contribute to the theoretical connection between RBV and SCM by demonstrating that supply chain integration was the mediating variable that helped internal capabilities and external forces to become digital transformation, customer centricity, and long-term competitiveness.

4.9.2 Managerial Implications

To practitioners, the results provide a number of practical implications. To begin with, the integration of the supply chain turns out to be the most potent tool to boost the digital and customer-centric performance. The fact that integration accounted 87.8% of the variance in digital transformation highlights the necessity of both the public and the private sector intervention in the direction of logistics collaboration, supplier information-sharing systems, and inventory synchronization among SMEs. Second, SMEs should prioritize gradual enterprise digital solutions. This can be facilitated by policy agencies through the provision of tax incentives, training programs with subsidies, and digital maturity assessments based on SME capabilities.

Third, the paper brings out the human aspect of competitiveness. The identified factors that have stimulated success were training, communication, and relationship-building with the staff and customers. According to one manager, most of the customers are known by their names and provided with after sales guidance; they are always ready to go back. This result demonstrates that customer intimacy is a characteristic of Thai SME competitiveness that supplements the digital efficiency with personalized service. To policymakers, this means that they should develop SME development programs that are balanced in terms of digital tools and human-focused service training. Leaders in the managerial practice must develop hybrid capability-building: investing in digital literacy and maintaining cultural assets like customer intimacy and personalized service, which are the pillars of Thai retail identity. This can also be supported by policymakers by providing programs that encourage integrated supply chain standards, digital innovation clusters, and SME-supplier networks of knowledge sharing.

5.CONCLUSION

5.1 Summary of Key Findings

This paper has explored the reasons of the contemporary trade development of SME hardware retail in the metropolitan region of Bangkok using an integrated supply chain approach. Using a mixed-methods design using a structural equation modelling and thematic analysis, the study established that modernization is contingent on the relationship between internal preparedness, external market adaptation, and supply chain integration. Quantitative analysis revealed that internal and external variables have a significant impact on the integration of the supply chain (ß = 0.608 = - 0.001), and integration of supply chain has a significant positive effect on digital transformation and customer-centric strategies (ß = 0.937 = - 0.001). Moreover, the mediation analysis established that the integration of the supply chain partially mediates the relationship between the internal/external factors and the trade outcomes (indirect ß = 0.311, 95% CI [0.208, 0.428]) which puts supply chain integration in a strategic position as an intermediary between the organizational readiness and market performance. This model was robust as indicated by model-fit indices (CFI = 0.971, RMSEA = 0.038, SRMR = 0.029). These findings were augmented by qualitative findings showing that there were five interrelated themes: internal readiness and resource capacity, external market pressures, supply chain collaboration, digitalization transformation efforts, and customer-centric strategies. The owners of SMEs enhanced that competitiveness and resilience in the fast-changing retail environment are achieved through managerial competence, financial discipline, and digital adaption.

5.2 Theoretical Contribution and Practical Implications

Theoretically, the research adds to the Resource-Based View (RBV) by demonstrating that internal resources, including managerial capability, financial capacity, and digital literacy, generate competitive advantage only when mobilized via supply chain integration. This helps to argue that capabilities are valuable when they are matched with the external environmental demands. The research also builds on the Supply Chain Management (SCM) theory by showing that the operational pathway between RBV resources and modernization outcomes is comprised of integration, collaboration, and digital responsiveness. These findings are consistent with Yan et al. (2023), who note that collaborative information processing can be used to improve the performance of SMEs, and with Mukherjee et al. (2023), who point out that supply chain resilience reinforces the competitive positioning. In practice, the results indicate that SME managers need to focus on logistics coordination, reinforce supplier relationships, and invest in digital tools, including CRM, e-commerce, and inventory systems, in a strategic manner. Policymakers ought to support the development of SMEs by enhancing digital literacy, providing supply chain financing, logistics networks that are powered by PPP, and financial incentives that enhance modernization.

5.3 Limitations and Future Research

This research has a number of limitations even though it is methodologically rigorous. Its cross-sectional nature limits causal inference, implying that longitudinal research would be more appropriate to understand how SME adaptation changes with time. The sample is also limited in terms of generalizability since it is restricted to hardware retail SMEs in Bangkok where digital readiness and supply-chain maturity might not be the same as in other regions or industries. The qualitative sample (n = 10) is informative but limited and could be expanded in terms of geographic and sectoral coverage. The external shocks, including post-pandemic recovery and global economic volatility, are not included because of time limitations, but they are likely to affect SME performance. Future research ought to broaden the framework to encompass environmental sustainability, circular-economy practices, and AI-driven innovation, and compare SMEs across Thai provinces, ASEAN markets, and firm sizes. On the whole, the research finds that the process of hardware retail SMEs transformation is the result of the joint impact of internal and external forces, and the integration of supply chains is the key process that connects readiness to digital transformation, customer relationships, and long-term competitiveness.

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