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DETERMINANTS OF ONLINE SALES PERFORMANCE IN THE REFRIGERATION AND ELECTRONICS SECTOR: FINANCIAL AND OPERATIONAL EVIDENCE FROM FIRMS IN THE ERA OF DIGITAL TRANSFORMATION AND ARTIFICIAL INTELLIGENCE

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ABSTRACT

This study extends the existing literature by developing and empirically testing an integrated framework that simultaneously examines the effects of e-service quality, technology and logistics support, and social influence on online sales performance in Vietnam's refrigeration and consumer electronics industry. Drawing on service quality theory, technology acceptance theory, and social influence theory, the research develops an integrated framework to examine how e-service quality, technology and logistics support, and social influence affect sales outcomes. Unlike previous studies that primarily investigated these determinants separately or in general e-commerce settings, this study integrates operational, technological, and social dimensions into a unified framework for a high-value product sector in an emerging economy.

A quantitative research design was employed, with data collected from customers experienced in online purchasing of high-value products. The reliability and validity of the measurement scales were assessed using Cronbach's alpha and exploratory factor analysis (EFA), while multiple regression analysis was employed to examine the proposed relationships. The findings reveal that all three factors exert significant positive effects on online sales performance, with e-service quality emerging as the most influential determinant. Technology and logistics support also play a crucial role, particularly in ensuring timely delivery, installation, and after-sales services. Social influence, reflected through online reviews and recommendations, further shapes purchasing decisions in digital environments. Importantly, the findings highlight that online sales performance in this sector is not only driven by digital platforms but also by integrated operational and service systems that directly affect financial outcomes, including cost efficiency and revenue stability.

The study advances the literature by providing one of the first integrated empirical examinations of online sales performance in Vietnam's refrigeration and consumer electronics sector, while offering practical evidence on how operational capabilities, digital technologies, and customer-oriented service strategies jointly enhance business performance in the era of digital transformation and artificial intelligence.

Keywords: accounting, finance, business performance, economics, artificial intelligence (AI), digital transformation, consumer electronics industry, profit

JEL Classification: F65, M40, M41, O15, M12

INTRODUCTION

The continued growth of e-commerce has significantly reshaped the retail sector, altering how businesses interact with consumers and deliver value in increasingly digital markets, particularly in emerging economies such as Vietnam. In sectors dealing with high-value and durable goods—such as refrigeration and electronics—online sales performance depends not only on digital platforms but also on integrated operational sys-

tems, including logistics, installation services, and after-sales support. These characteristics make the sector distinct from conventional e-commerce contexts and raise important questions regarding the financial and operational determinants of sales performance.

From a theoretical standpoint, online sales performance has been examined through various conceptual frameworks that explain how organizational, technological, and customer-related factors influence business outcomes, including service quality theory, technology acceptance theory, and social influence theory. Service quality theory emphasizes the role of customer experience in shaping purchasing behavior, while technology acceptance theory highlights the importance of technological infrastructure in facilitating user adoption. Social influence theory further explains how external factors, such as online reviews and peer recommendations, affect consumer decisions in digital environments.

Empirically, prior studies have consistently shown that e-service quality, logistics capability, and digital platforms are key drivers of e-commerce performance. However, most existing research focuses on general consumer goods or digital services, with limited attention given to sectors characterized by high product value, complex logistics, and installation requirements. In the refrigeration and electronics sector, firms must manage not only inventory and delivery but also installation services and additional materials, which significantly affect cost structures and financial performance.

In the era of digital transformation and artificial intelligence (AI), firms are increasingly integrating advanced digital technologies into their business processes to enhance operational efficiency, customer engagement, and strategic decision-making. AI-enabled systems facilitate demand forecasting, inventory control, and logistics coordination, thereby improving resource utilization, reducing operational costs, and strengthening overall business performance. However, these developments also increase the complexity of managing online sales performance, particularly in sectors with high working capital requirements.

In response to these challenges, this study investigates the key determinants of online sales performance in Vietnam's refrigeration and consumer electronics sector. The research integrates service quality, technology and logistics support, and social influence to explain sales outcomes in a digitalized environment.

LITERATURE REVIEW

Theoretical framework

Service Quality Theory: Service quality theory posits that customer perceptions of service excellence significantly influence satisfaction and behavioral intentions (Parasuraman et al., 2005). In online contexts, e-service quality includes website functionality, responsiveness, and reliability. In this study, service quality is expected to directly enhance online sales performance by improving customer experience and trust.

Technology Acceptance Theory (TAM): Within the Technology Acceptance Model (TAM), perceived usefulness and perceived ease of use are regarded as key antecedents of technology adoption, influencing users' acceptance of digital technologies and AI-enabled systems (Davis, 1989). In e-commerce, technological infrastructure, such as digital platforms and logistics systems, plays a crucial role in enabling transactions. This study applies TAM to explain how technology and logistics support influence online sales performance.

Social Influence Theory: Social influence theory highlights the role of external opinions and social interactions in shaping individual behavior (Venkatesh et al., 2003). In digital commerce, online reviews, ratings, and recommendations affect purchasing decisions. This study incorporates social influence as a determinant of online sales performance in the Vietnamese context.

Literature review

Recent studies increasingly recognize e-service quality as a critical driver of online sales performance, particularly in digitally transformed business environments where AI-enabled technologies shape customer interactions and service delivery. Parasuraman et al. (2005) show that reliability and responsiveness significantly influence customer satisfaction and purchase intentions. However, these studies often focus on service industries rather than product-based sectors with complex logistics.

Ernawati et al. (2025) found that perceived ease of use and trust significantly enhance e-commerce usage intention, while perceived usefulness indirectly influences user behavior through attitudes. These findings suggest that user-friendly and trustworthy digital platforms can improve online sales performance by encouraging customer engagement. However, the study focuses on behavioral intention rather than actual firm-level sales outcomes.

Farhat et al. (2025) reported that trust strengthens online purchasing behavior, customer loyalty, and long-term engagement in e-commerce environments. This implies that trust can contribute to higher online sales performance by increasing repeat purchases and customer retention. Nevertheless, the study emphasizes consumer behavior without examining operational or financial performance.

Handoyo (2024) demonstrated through a meta-analysis that trust is one of the strongest predictors of e-commerce behavior and interacts with perceived risk and security. Their findings reinforce the strategic role of trust in improving online sales performance. However, the analysis does not consider industry-specific contexts, particularly high-value product sectors such as refrigeration and consumer electronics.

Nagy and Hajdu (2022) showed that perceived usefulness and trust significantly influence consumer acceptance of AI-enabled online shopping systems. Their results indicate that AI-supported technologies can enhance online sales performance by improving customer experience and service efficiency. However, the study primarily examines technology adoption rather than business performance at the organizational level.

Yurchyshyn et al. (2025) employed econometric modeling to examine how external economic, technological, and institutional factors influence the performance of trading enterprises. Their findings indicate that technological conditions and the external business environment significantly affect firms' operational outcomes and sales growth. These results suggest that online sales performance should be interpreted within a broader business ecosystem rather than solely through customer-related factors. However, the study does not specifically investigate e-commerce capabilities or consumer behavior in digital retail environments.

Similarly, Shchelkunov et al. (2025) emphasized that effective business partnerships contribute to improving operational coordination, resource integration, and organizational performance. Their findings imply that collaboration among firms and supply-chain partners can indirectly enhance online sales performance by strengthening logistics efficiency and service quality. Nevertheless, the study focuses on business partnership analysis in the motor vehicle sector and does not examine digital commerce or the determinants of online sales performance.

Other research highlights the importance of logistics and technological infrastructure (Rita et al., 2019; Venkatesh et al., 2012). Rita et al. (2019) demonstrated that logistics service quality, including delivery reliability and responsiveness, significantly influences customer satisfaction and repurchase intentions in online retail environments. Similarly, Venkatesh et al. (2012) emphasized that system quality, technological reliability, and user experience are critical determinants of online platform performance and customer retention. Nevertheless, these studies primarily focus on consumer behavior and technology adoption, while paying limited attention to the financial implications of logistics efficiency in sectors characterized by high-value products, inventory intensity, and complex delivery requirements, such as refrigeration and consumer electronics. Besides, these studies in e-commerce demonstrate that delivery efficiency and system reliability directly affect customer retention and operational performance. Nevertheless, these studies tend to overlook the financial implications of logistics in high-value product sectors.

Other research has emphasized the strategic importance of logistics performance and technological infrastructure in e-commerce environments. For instance, Hübner et al. (2016) argued that last-mile fulfillment efficiency constitutes a critical component of online retail competitiveness, particularly in sectors characterized by product complexity, inventory intensity, and customer expectations regarding delivery speed and reliability. Their study demonstrated that logistics planning and distribution strategies directly influence operational effectiveness and customer satisfaction, highlighting the role of fulfillment systems as a source of competitive advantage in digital commerce. However, the authors primarily focused on retail logistics optimization and did not examine the broader financial consequences of logistics performance for firms selling high-value durable goods.

Similarly, Vakulenko et al. (2018) investigated customer perceptions of last-mile delivery services in e-commerce and found that delivery reliability, convenience, and service transparency significantly enhance customer value and repurchase intentions. Their findings suggest that logistics quality extends beyond operational efficiency and plays an important role in shaping customer retention and long-term business performance. Nevertheless, the study concentrated mainly on customer experience and consumer behavior perspectives, while providing limited discussion regarding how logistics performance affects sales outcomes, working capital management, inventory turnover, and financial sustainability.

Taken together, these studies provide strong evidence that logistics capability and technological reliability are essential determinants of e-commerce success. However, existing research has largely focused on general retail settings and customer-centric outcomes, with relatively limited attention devoted to industries involving high-value products, substantial inventory investments, and complex distribution requirements, such as refrigeration and consumer electronics. Moreover, little empirical evidence exists regarding how logistics-related factors interact with technology acceptance, trust, and online

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sales performance in emerging markets such as Vietnam. This gap highlights the need for further investigation into the operational and financial mechanisms through which digital platforms, customer trust, and logistics capabilities contribute to online sales performance in Vietnam's refrigeration and consumer electronics industry.

Social influence has also been widely studied in digital environments. Venkatesh et al. (2003) demonstrate that peer influence and social norms significantly affect technology adoption. Recent research underscores the strategic role of online reviews and social media in influencing consumer behavior within emerging markets, particularly in digitally connected environments where AI-driven recommendation systems and user-generated content increasingly shape purchasing decisions.

Social influence also represents an important determinant of online purchasing behavior and sales outcomes. Erkan and Evans (2016) found that electronic word-of-mouth affects consumers' purchase intentions through information quality, credibility, usefulness, and information adoption. More recently, Wang and Shahzad (2024) conducted a quantitative meta-analysis of social commerce and showed that social, technological, and motivational factors significantly shape consumer purchase intentions. These findings suggest that online reviews, peer recommendations, influencer content, and social media interactions can affect customer trust and purchase decisions. In Vietnam's consumer electronics market, where buyers often rely on online reviews, user ratings, livestream demonstrations, and community recommendations before purchasing expensive products, social influence may strengthen customer confidence and indirectly improve online sales performance.

Furthermore, digital transformation research shows that firms leveraging AI and data analytics can improve operational efficiency and decision-making (Vial, 2019). However, the application of these technologies in sectors such as refrigeration and electronics remains underexplored. The transformation of traditional e-commerce into the SC is also aided by the development of mobile payment technology and the success of the new SC platform (Islam & Habib, 2021).

Recent studies have increasingly emphasized the role of logistics service quality and digital capabilities in shaping e-commerce performance. For instance, research on e-commerce logistics shows that factors such as delivery timeliness, order accuracy, and return handling significantly influence customer satisfaction and loyalty (Akil & Ungan, 2022). These findings suggest that logistics performance is a key operational driver of online sales outcomes.

More recent empirical evidence highlights that logistics service quality directly affects product satisfaction in e-commerce environments, although some dimensions such as shipping time or cost may not always have significant effects (Rashid & Rasheed, 2024). This indicates that customer perceptions of value are influenced by multiple service dimensions rather than a single factor.

In emerging markets, including Vietnam, research points to a growing importance of logistics systems in supporting digital commerce. However, there remains limited empirical evidence on how logistics service quality influences consumer behavior in such contexts (Ngo et al., 2025). This gap is particularly relevant for high-value product sectors, where logistics complexity and service requirements are significantly higher.

Furthermore, recent studies emphasize that improvements in logistics performance — such as faster delivery, cost reduction, and efficiency enhancement—can significantly improve firm competitiveness in e-commerce environments (Wu et al., 2024). These findings highlight the strong link between operational efficiency and financial performance.

Although existing research has investigated service quality, logistics capabilities, and digital systems as separate determinants of online performance, limited evidence exists on their integrated effects within high-value product industries. Against the backdrop of digital transformation and increasing AI adoption, this study examines how service quality, logistics effectiveness, and social influence jointly influence online sales performance in Vietnam's refrigeration and consumer electronics sector.

Based on established measures reported in prior research, the scales for the independent and dependent constructs were adapted and are presented in Table 1.

Table 1. Scales for the independent and dependent variables.

Code	Description	Sources
Online Sales Performance (OSP)		
OSP1	Online sales revenue has increased significantly.	Rego et al. (2009); Trainor et al. (2014)
OSP2	The conversion rate from browsing to purchasing is high.	
OSP3	Online market share has improved.	
OSP4	Customer satisfaction with online purchases is high.	
E-service Quality (ESQ)		
ESQ1	Delivery is timely and reliable.	Parasuraman et al. (2005)
ESQ2	Installation services are professional and efficient.	
ESQ3	Customer support is responsive and helpful.	
ESQ4	After-sales services (warranty, maintenance) are satisfactory.	
Technology and Logistics Support (TLS) This construct captures the extent to which technological infrastructure and logistics systems support online shopping activities.		
TLS1	The online platform operates stably without technical issues.	Venkatesh et al. (2003)
TLS2	Multiple secure payment options are available	
TLS3	Logistics and delivery systems are efficient.	
TLS4	Order tracking is accurate and convenient.	
Social Influence (SI) Social influence refers to the extent to which customers are affected by others' opinions in their purchasing decisions.		
SI1	Online reviews influence my purchase decisions.	Venkatesh et al. (2003)
SI2	Recommendations from friends or relatives affect my choices.	
SI3	Influencers (KOLs/KOCs) impact my purchasing decisions.	

Hypotheses development

Building upon the proposed theoretical framework and existing empirical evidence, this study formulates three hypotheses to examine the determinants of online sales performance in Vietnam's refrigeration and consumer electronics sector. These hypotheses are grounded in service quality theory, technology acceptance theory, and social influence theory, while also reflecting the specific characteristics of high-value product markets.

E-service quality and online sales performance

Extensive research has identified e-service quality as a key driver of customer satisfaction and online purchasing behavior in digital commerce environments. According to Parasuraman et al. (2005), reliability, responsiveness, and service assurance significantly influence customers' trust and perceived value. In the context of refrigeration and electronics products, service quality extends beyond the digital interface to include delivery accuracy, installation quality, and after-sales support. Given the high value and technical complexity of these products, customers are more sensitive to service failures, which can lead to returns, additional costs, and reputational damage.

From a financial perspective, higher service quality reduces transaction uncertainty, enhances customer retention, and stabilizes revenue streams. Firms that invest in service quality can reduce the costs associated with returns, complaints, and warranty claims, thereby improving profitability and operational efficiency. In the era of digital transformation, AI-enabled customer support systems and service automation further enhance service consistency and responsiveness. Therefore, it is expected that:

- **H_1**: E-service quality has a positive and significant effect on online sales performance.

Technology and logistics support and online sales performance

Technology and logistics support play a fundamental role in enabling efficient online sales operations. Within the Technology Acceptance Model (TAM), perceived usefulness and system efficiency are regarded as key factors influencing users' acceptance and utilization of digital technologies (Davis, 1989). In e-commerce environments, technological infrastructure

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includes website functionality, payment systems, and data integration, while logistics support encompasses delivery, warehousing, and installation services.

In the refrigeration and electronics sector, logistics is particularly complex due to the size, weight, and installation requirements of products. Logistics inefficiencies may result in delivery delays, product damage, and higher operational costs, thereby adversely affecting business performance and customer satisfaction. From a financial perspective, logistics inefficiency directly affects working capital, as firms must hold higher inventory levels and absorb additional transportation and installation costs. In contrast, effective logistics systems enhance inventory turnover, lower holding costs, and improve cash flow management, thereby contributing to greater operational efficiency and business performance.

With the advancement of digital technologies and AI, firms can optimize logistics through route planning, demand forecasting, and real-time tracking. These improvements not only enhance customer satisfaction but also strengthen financial performance by reducing operational risks. Therefore, the following hypothesis is proposed:

- **H_2:** Technology and logistics support have a positive and significant effect on online sales performance.

Social influence and online sales performance

Social influence theory suggests that individuals' decisions are shaped by the opinions and behaviors of others (Venkatesh et al., 2003). In digital commerce, social influence manifests through online reviews, ratings, social media interactions, and recommendations. These factors are particularly important in emerging markets, where consumers rely heavily on peer feedback to reduce perceived risk.

For high-value products such as refrigeration and electronics, consumers are more cautious and tend to seek additional information before making purchase decisions. Positive reviews and strong social endorsement can significantly increase consumer confidence, while negative feedback may deter purchases. From a financial perspective, social influence affects not only sales volume but also revenue stability and customer acquisition costs.

In the era of AI and digital platforms, algorithms amplify social influence by recommending products based on user behavior and social trends. This increases the visibility of highly rated products and strengthens the impact of social proof on purchasing decisions. Therefore, it is hypothesized that:

- **H_3:** Social influence has a positive and significant effect on online sales performance.

AIMS AND OBJECTIVES

This study pursues several research objectives. The first objective is to examine the effect of e-service quality on online sales performance in Vietnam's refrigeration and consumer electronics sector. Second, to investigate the role of technology and logistics support in enhancing sales outcomes. Third, to assess the influence of social factors on consumer purchasing behavior in digital environments.

To achieve these objectives, the study is guided by the following research questions:

- RQ1: How does e-service quality affect online sales performance?
- RQ2: To what extent do technology and logistics support influence online sales outcomes?
- RQ3: How does social influence shape consumer purchasing decisions in the context of digital commerce?

METHODS

A quantitative research approach was adopted to investigate the determinants of online sales performance in Vietnam's refrigeration and consumer electronics sector. The research approach is appropriate because it allows for the systematic measurement and analysis of relationships between key variables, including e-service quality, technology and logistics support, social influence, and online sales performance.

Data Collection and Sample: Data were collected using a structured questionnaire distributed to respondents with experience in purchasing refrigeration and electronics products online. The sampling method ensures that respondents are familiar with digital commerce and capable of evaluating service quality, logistics performance, and social influence factors. The final sample size meets the methodological requirements for reliability assessment, exploratory factor analysis, and regression analysis, thereby supporting the robustness of the statistical results. The sample includes a diverse group of respondents in terms of age, gender, and purchasing experience, which enhances the representativeness of the data.

However, the study focuses on the Vietnamese market, reflecting the characteristics of an emerging economy undergoing rapid digital transformation.

Measurement Scales: The measurement items were adapted from validated scales reported in prior studies and refined to fit the research context. All constructs were operationalized using multiple indicators measured on a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). E-service quality is measured through indicators such as reliability, responsiveness, and service assurance. Technology and logistics support are measured through system efficiency, delivery performance, and installation services. Social influence is measured through online reviews, recommendations, and social media impact. The dependent variable, online sales performance, reflects customers' perceptions of purchasing effectiveness and satisfaction. The use of validated measurement scales enhances the reliability and comparability of the study, while contextual adaptation ensures relevance to the refrigeration and electronics sector.

Data Analysis Techniques: The study follows a multi-step analytical procedure using SPSS software. Descriptive statistics were first conducted to characterize the sample and provide an initial understanding of the dataset. Subsequently, Cronbach's alpha was used to evaluate the internal consistency and reliability of the measurement scales. All constructs are expected to meet the recommended threshold of 0.7, indicating acceptable reliability. Exploratory factor analysis (EFA) was performed to assess construct validity and examine the underlying factor structure of the measurement items. The Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were employed to verify the suitability of the data for factor analysis. Factor loadings exceeding 0.50 were deemed acceptable, indicating that the observed items adequately represented their respective constructs.

Hypothesis Testing: To test the proposed hypotheses, the study employs correlation analysis and multiple regression analysis. Correlation analysis is used to examine the relationships between independent variables and online sales performance, while regression analysis evaluates the magnitude and significance of these effects. Multiple regression analysis was employed to estimate standardized coefficients and evaluate the relative contribution of each predictor to online sales performance. The explanatory power of the model was assessed using the coefficient of determination (R^2), while the Durbin–Watson statistic was examined to detect potential autocorrelation in the residuals. Statistical significance was evaluated at the 5% level.

Additional Analysis: In addition to regression analysis, independent-samples t-tests and one-way ANOVA were conducted to assess differences in respondents' perceptions across demographic characteristics. These techniques provide additional insights into whether factors influencing online sales performance vary across gender, job position, or experience levels. This comprehensive methodological approach ensures the robustness of the findings and provides a solid foundation for interpreting the financial and operational implications of online sales performance within an increasingly digitalized and AI-enabled business environment.

Next, research the model (Figure 1).

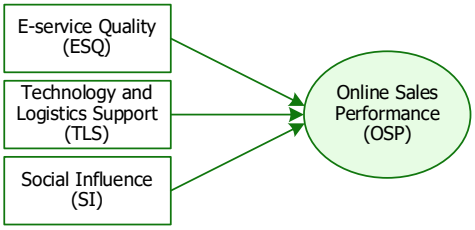

Figure 1. Research model.

RESULTS

The Quality Scale Analysis Result

Table 2 presents the reliability analysis results of the measurement scales used in the study. The analysis aims to assess the internal consistency and reliability of the measurement constructs, including E-service Quality, Technology and Logistics Support, Social Influence, and Online Sales Performance.

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Table 2. Analysis of factors' confidence of scales. *(Source: prepared by the authors (2025) and SPSS software)*

Determinants	N	Cronbach's Alpha	Corrected Item-Total Correlation
E-service Quality (ESQ)	4	0.871	0.714
Technology and Logistics Support (TLS)	4	0.905	0.733
Social Influence (SI)	3	0.736	0.518
Online sales performance (OSP)	4	0.870	0.645

The findings show that all constructs exceed the recommended Cronbach's alpha threshold of 0.70, indicating satisfactory reliability and internal consistency. In particular, Technology and Logistics Support exhibits the highest reliability (α = 0.905), reflecting the critical role of logistics systems and technological infrastructure in supporting high-value refrigeration products (Hair et al., 2010; 2014; 2019). From a financial perspective, reliable logistics systems reduce operational risk, delivery delays, and additional costs associated with installation services.

Table 3 reports item-level reliability statistics, including corrected item–total correlations and Cronbach's alpha coefficients if individual items are removed from the scale.

Table 3. Results of Cronbach's Alpha testing of attributes and item-total statistics. *(Source: prepared by the authors (2025) and SPSS software)*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
E-service Quality (ESQ): α = 0.871				
ESQ1	9.360	4.013	.729	.834
ESQ2	9.331	4.354	.745	.831
ESQ3	9.211	3.961	.721	.837
ESQ4	9.366	4.101	.714	.840
Technology and Logistics Support (TLS): α = 0.905				
TLS1	9.246	3.739	.733	.896
TLS2	9.117	3.691	.790	.877
TLS3	9.131	3.564	.823	.865
TLS4	9.209	3.323	.809	.871
Social Influence (SI): α = 0.736				
SI1	6.654	2.427	.523	.692
SI2	6.589	2.420	.518	.697
SI3	6.403	1.920	.647	.538
Online sales performance (OSP): α = 0.870				
OSP1	10.549	5.899	.645	.864
OSP2	10.514	5.528	.740	.826
OSP3	10.786	5.556	.740	.827
OSP4	10.631	5.316	.767	.815

All measurement items exhibit corrected item– total correlations exceeding 0.50, indicating satisfactory item reliability and consistency with their respective constructs, confirming their contribution to the constructs. The stability of the scale indicates that customers consistently evaluate online sales performance based on both product delivery and service-related factors (Hair et al., 2010; 2014; 2019).

This is particularly important in the refrigeration sector, where installation and after-sales services significantly influence customer satisfaction and revenue sustainability.

Exploratory Factor Analysis (EFA)

Table 4 reports the results of the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity, which were used to evaluate the suitability of the data for exploratory factor analysis (EFA).

Table 4. KMO and Bartlett's Test. *(Source: prepared by the authors (2025) and SPSS software)*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.811
Bartlett's Test of Sphericity	Approx. Chi-Square	2033.775
	Df	55
	Sig.	0.000

A KMO value of 0.811 and a statistically significant Bartlett's test of sphericity ($p < 0.001$) indicate that the dataset is suitable for exploratory factor analysis, confirming that the observed variables possess sufficient intercorrelations and shared variance to support factor extraction (Hair et al., 2010, 2014, 2019). These results provide strong evidence of construct validity and suggest that the measurement items reliably capture the underlying dimensions of E-service Quality (ESQ), Technology and Logistics Support (TLS), Social Influence (SI), and Online Sales Performance (OSP).

From a financial and economic perspective, the adequacy of the factor structure implies that the selected variables represent coherent and meaningful drivers of online business performance in Vietnam's refrigeration and consumer electronics industry. This is particularly important because firms operating in this sector face substantial investments in inventory, warehousing, logistics infrastructure, after-sales services, and digital commerce platforms. The strong common variance among the observed variables suggests that improvements in service quality, logistics capabilities, technological support, and social influence mechanisms are not isolated operational activities but interconnected factors that jointly contribute to revenue generation, customer retention, and sales growth.

Furthermore, the results indicate that managerial decisions related to digital infrastructure, logistics systems, and customer engagement strategies can be evaluated within a consistent analytical framework. In practical terms, this provides a reliable basis for identifying the key determinants of online sales performance and supports more efficient allocation of financial resources toward digital transformation initiatives, AI-enabled customer services, logistics optimization, and social commerce activities. Consequently, the validity of the factor structure enhances the credibility of subsequent analyses and strengthens the study's ability to generate meaningful managerial implications for improving competitiveness and financial performance in the online retail market.

Table 5 reports the proportion of total variance explained by the extracted factors, providing evidence of the explanatory capacity of the factor solution.

Table 5. Total Variance Explained. *(Source: prepared by the authors (2025) and SPSS software)*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		Extraction Sums of Squared Loadings		Rotation Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.216	38.329	38.329	4.216	38.329	38.329	3.097	28.151	28.151
2	2.226	20.235	58.564	2.226	20.235	58.564	2.914	26.490	54.641
3	1.637	14.885	73.449	1.637	14.885	73.449	2.069	18.807	73.449
4	.649	5.901	79.350						
5	.496	4.509	83.859						
6	.401	3.645	87.504						
7	.344	3.123	90.627						
8	.320	2.911	93.538						
9	.280	2.550	96.088						
10	.256	2.330	98.418						
11	.174	1.582	100.000						

The three extracted factors explain 73.449% of total variance, indicating strong explanatory power (Hair et al., 2010; 2014; 2019). This suggests that online sales performance in the refrigeration sector is largely driven by a combination of

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service quality, logistics capability, and social influence. From a financial standpoint, this highlights the importance of integrated operational systems in maximizing sales efficiency.

Correlation Analysis Results

Table 6 reports the Pearson correlation coefficients among the independent variables and online sales performance, providing preliminary evidence of the relationships among the study constructs.

Table 6. Correlation between independent and dependent variables. *(Source: prepared by the authors (2025) and SPSS software)*

Description		OSP	ESQ	TLS	SI
OSP	Pearson Correlation	1	.409**	.338**	.371**
	Sig. (2-tailed)	0.0	.000	.000	.000
	N	350	350	350	350
ESQ	Pearson Correlation	.409**	1	.272**	.254**
	Sig. (2-tailed)	.000	0.0	.000	.000
	N	350	350	350	350
TLS	Pearson Correlation	.338**	.272**	1	.275**
	Sig. (2-tailed)	.000	.000	0.0	.000
	N	350	350	350	350
SI	Pearson Correlation	.371**	.254**	.275**	1
	Sig. (2-tailed)	.000	.000	.000	0.0
	N	350	350	350	350

All independent variables exhibit positive and statistically significant correlations with online sales performance ($p < 0.01$), providing preliminary support for the proposed relationships. E-service Quality has the strongest correlation ($r = 0.409^{**}$), followed by Social Influence ($r = 0.371^{**}$) and Technology and Logistics Support ($r = 0.338^{**}$). These findings indicate that both service-related and social factors contribute to sales outcomes (Hair et al., 2010; 2014; 2019). Financially, higher service quality can enhance customer retention and revenue stability.

Result of Regression Model Analysis

Table 7 summarizes the regression model results, including R-square and Durbin-Watson statistics.

Table 7. Model Summary [b]. Note: a - Predictors: (Constant), SI, ESQ, TLS; b - Dependent Variable: OSP. *(Source: prepared by the authors (2025) and SPSS software)*

Model	R	R2	Adjusted R2	Std. Error of the Estimate	Durbin-Watson
1	.525a	.275	.269	.65867	2.089

The regression model explains 27.5% of the variation in online sales performance ($R^2 = 0.275$), indicating a moderate but meaningful level of explanatory power. Furthermore, the Durbin–Watson statistic of 2.089 suggests that the residuals are independent and that no significant autocorrelation problem exists, supporting the reliability of the regression estimates (Hair et al., 2010, 2014, 2019). These findings confirm that the proposed model provides a statistically sound framework for examining the determinants of online sales performance.

From a financial and economic perspective, the explanatory power of the model is particularly relevant for firms operating in Vietnam's refrigeration and consumer electronics industry, where online sales outcomes are influenced by both customer-related and operational factors. The finding that e-service quality, technology and logistics support, and social influence collectively explain more than one-quarter of the variation in sales performance suggests that investments in digital platforms, logistics infrastructure, and customer engagement mechanisms can generate measurable business value. In practical terms, improving website functionality, delivery reliability, online customer support, and social media interactions may contribute to higher conversion rates, increased customer retention, and stronger revenue growth.

At the same time, the remaining unexplained variation indicates that additional financial and operational factors — such as pricing strategies, promotional campaigns, inventory availability, brand reputation, after-sales services, and AI-enabled personalization — may also influence online sales performance. This highlights the complex nature of e-commerce success in high-value product industries and suggests that firms should adopt an integrated strategy combining technological investments with broader marketing and operational initiatives to maximize financial performance and long-term competitiveness.

Table 8 reports the ANOVA results used to assess the overall statistical significance and goodness-of-fit of the regression model.

Table 8. ANOVA[a]. Note: a - Dependent Variable: OSP; b - Predictors: (Constant), SI, ESQ, TLS. *(Source: Prepared by the authors (2025) and SPSS software)*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	57.078	3	19.026	43.854	.000b
	Residual	150.112	346	.434	0.0	0.0
	Total	207.190	349	0.0	0.0	0.0

The ANOVA results indicate that the regression model is statistically significant ($F = 43.854$, $p < 0.001$), demonstrating that the independent variables jointly explain a significant proportion of the variation in online sales performance (Hair et al., 2010; 2014; 2019). This finding confirms the overall robustness of the research framework and supports the relevance of E-service quality, technology and logistics support, and social influence as determinants of online sales outcomes.

From an economic perspective, the significance of the model suggests that these factors should not be viewed as isolated operational activities but rather as strategic resources that contribute to business performance. In the refrigeration and consumer electronics sector, where products often involve high transaction values, substantial logistics costs, and strong competition among online retailers, the ability to deliver superior digital experiences and reliable logistics services can directly affect customer acquisition and sales growth. Firms that successfully integrate service quality, technological capability, and social engagement into their online business models are more likely to achieve sustainable revenue expansion and stronger market positioning.

Moreover, the significant ANOVA result implies that managerial investments in digital transformation initiatives—including AI-driven customer support, data analytics, logistics optimization systems, and social commerce platforms—can generate meaningful returns by enhancing online sales effectiveness. As consumer purchasing behavior increasingly shifts toward digital channels, these capabilities become critical for improving operational efficiency, strengthening customer trust, and creating long-term shareholder value. Therefore, the results provide empirical support for strategic investments in technology-enabled sales ecosystems within Vietnam's rapidly evolving e-commerce environment.

Table 9 presents the estimated regression coefficients for the independent variables, providing evidence of their respective effects on online sales performance.

Table 9. Regression model[a]. Note: a - Dependent Variable: OSP. *(Source: Prepared by the authors (2025) and SPSS software)*

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.878	.237	0.0	3.704	.000	0.0	0.0
	E-service Quality	.344	.056	.296	6.099	.000	.892	1.122
	Technology and Logistics Support	.236	.061	.190	3.900	.000	.881	1.136
	Social Influence	.266	.053	.244	5.020	.000	.890	1.124

All three factors positively and significantly influence online sales performance. E-service Quality has the strongest effect ($\beta = 0.296$), followed by Social Influence ($\beta = 0.244$) and Technology and Logistics Support ($\beta = 0.190$) (Hair et al., 2010; 2014; 2019). This suggests that customer experience and service reliability are more influential than purely technical infrastructure. In financial terms, investing in service quality yields higher marginal returns compared to logistics improvements alone.

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Although financial variables were not directly included in the regression model, the findings indirectly highlight the importance of financial management. The significant impact of logistics and service quality suggests that firms with better inventory turnover and working capital management are more capable of sustaining high service levels. This implies that financial efficiency is a hidden driver of online sales performance in high-value product sectors.

The empirical findings regarding the determinants of online sales performance in Hanoi's refrigeration sector are summarized below.

$$OSP = \alpha + 0.296ESQ + 0.190TLS + 0.244SI + \varepsilon.$$

Table 10 summarizes the results of the hypothesis testing, indicating the significance and direction of the proposed relationships.

Table 10. Hypothesis Testing Results. *(Source: prepared by the authors (2025))*

No	Hypotheses	Test results	Trends of influence
1	H1	Accept	+
2	H2	Accept	+
3	H3	Accept	+

Residual Analysis Result

Figure 2 illustrates the distribution of standardized predicted values of the regression model.

Figure 2. Regression Standardized Predicted Value.

Figure 2 shows that residuals are normally distributed around the mean, indicating that the regression assumptions are satisfied (Hair et al., 2010; 2014). This confirms the robustness of the model and supports the validity of the estimated relationships. From a financial modeling perspective, this ensures that the results can be used for forecasting and decision-making.

DISCUSSION

The findings of this study largely support previous research emphasizing the importance of digital service quality in improving online business performance. The significant positive effect of e-service quality is consistent with the studies of Parasuraman et al. (2005) and Rita et al. (2019), who argued that efficient online services, reliable systems, and responsive customer support strengthen customer satisfaction and encourage purchasing behavior. Our results further extend these studies by demonstrating that, in Vietnam's refrigeration and consumer electronics industry, e-service quality contributes not only to customer experience but also to firm-level online sales performance. This finding is particularly relevant for high-value products, where consumers require accurate information, secure transactions, and dependable after-sales services before making purchasing decisions.

The findings also agree with Vakulenko et al. (2018), Hübner et al. (2016), and Yurchyshyn et al. (2025), who highlighted the strategic importance of logistics capability and operational infrastructure for business performance. However, unlike these studies, which mainly examined logistics efficiency and operational outcomes, the present study demonstrates that technology and logistics support directly improve online sales performance in the context of high-value consumer products. This suggests that investments in delivery systems, installation services, warehouse coordination, and digital logistics platforms should be considered strategic financial investments capable of enhancing sales growth, operational efficiency, and long-term competitiveness rather than merely reducing operating costs.

The positive effect of social influence is consistent with Venkatesh et al. (2003), Erkan and Evans (2016), Handoyo et al. (2024), and Farhat et al. (2025), all of whom emphasized that trust, electronic word-of-mouth, and social interactions significantly influence consumers' online purchasing decisions. Nevertheless, the present study extends the existing literature by demonstrating that social influence affects not only purchase intention but also actual online sales performance at the organizational level. This finding is particularly important in Vietnam, where consumers increasingly rely on social media reviews, influencer recommendations, and online communities when purchasing expensive refrigeration and consumer electronics products. In contrast, our findings only partially align with studies that primarily focus on behavioral intention, such as Ernawati et al. (2025), because the current research examines realized business outcomes rather than consumers' intention to use digital platforms.

Overall, this study advances the literature by integrating e-service quality, technology and logistics support, and social influence into a single analytical framework explaining online sales performance in a specific industrial context. While previous studies generally investigated these determinants separately or emphasized customer behavioral outcomes, the present research provides empirical evidence that operational capabilities, digital infrastructure, and social interaction mechanisms jointly contribute to firms' financial and operational performance. These findings are particularly relevant in the era of digital transformation and artificial intelligence, where firms increasingly rely on AI-enabled customer service, intelligent logistics systems, predictive analytics, and digital marketing to improve competitiveness and create sustainable business value.

Implications

Financial strategy and working capital optimization

The results imply that firms in the refrigeration and electronics sector should adopt a working-capital-centric strategy to support online sales growth. Given the high value, bulky nature, and installation requirements of products (e.g., air conditioners, refrigerators, TVs), inventory holding costs, last-mile delivery, and installation expenses materially affect cash cycles. Managers should implement tighter inventory turnover policies, demand forecasting, and vendor-managed inventory (VMI) to reduce holding periods and obsolescence risk. Faster inventory turnover not only improves liquidity but also lowers financing needs and interest costs, which is critical in credit-constrained environments.

Integration of logistics with financial performance management

The significant role of Technology and Logistics Support suggests that logistics capability must be treated as a financial lever rather than a purely operational function. Firms should integrate logistics KPIs (delivery lead time, installation cycle time, return rates) with financial metrics (cash conversion cycle, operating margin, cost-to-serve). Investment in route optimization, warehouse automation, and real-time tracking can reduce delivery failures and rework costs, thereby improving margins and cash flow stability. From a credit perspective, improved logistics reliability enhances lenders' confidence by reducing operational risk.

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Service quality as a driver of revenue quality and creditworthiness

E-service quality emerges as the strongest determinant, indicating that customer experience directly influences not only sales volume but also revenue quality (repeat purchases, lower churn, fewer returns). Firms should allocate budgets toward after-sales service, installation quality, and customer support systems. Higher service quality stabilizes cash inflows and reduces revenue volatility—factors that positively affect firm valuation and credit ratings. This aligns with the notion that intangible service investments can yield tangible financial returns in digital commerce.

Digital transformation and AI-enabled financial decision-making

Digital platforms and AI should be leveraged to enhance both demand-side and supply-side decisions. On the demand side, AI-driven recommendation systems and dynamic pricing can increase conversion rates and revenue per customer. On the supply side, predictive analytics can optimize inventory levels, forecast demand seasonality (e.g., peak summer demand for air conditioners), and minimize stockouts or overstocking. Integrating these tools into financial planning improves budgeting accuracy, working capital allocation, and risk management.

Policy implications for financial and credit systems

At the policy level, regulators and financial institutions should recognize the specific financing needs of the refrigeration and electronics sector. Credit products should be tailored to support inventory financing, logistics infrastructure, and digital transformation investments. Moreover, standardized metrics linking operational performance to financial outcomes (e.g., inventory turnover ratios, logistics efficiency scores) can improve credit assessment frameworks and reduce information asymmetry between firms and lenders.

CONCLUSIONS

This study examined the determinants of online sales performance in Vietnam's refrigeration and consumer electronics industry by integrating e-service quality, technology and logistics support, and social influence into a unified analytical framework. Based on survey data collected from online consumers and analyzed using Cronbach's alpha, exploratory factor analysis (EFA), and multiple regression analysis, the proposed model was found to be statistically robust ($F = 43.854$, $p < 0.001$), explaining 27.5% of the variation in online sales performance ($R^2 = 0.275$). The findings indicate that all three determinants exert significant positive effects on online sales performance. Among them, e-service quality emerged as the strongest predictor, followed by technology and logistics support and social influence, highlighting the complementary roles of digital service excellence, operational capability, and customer interaction in improving online business outcomes.

The study contributes to the existing literature by extending previous research beyond technology acceptance and consumer purchase intention to explain actual online sales performance at the organizational level. Unlike many earlier studies that examined service quality, logistics capability, or social influence independently, this research demonstrates that these factors jointly shape firms' financial and operational performance within a high-value product industry characterized by complex logistics, installation services, and substantial working capital requirements. The findings further suggest that investments in digital platforms, AI-enabled customer services, intelligent logistics systems, and social commerce strategies should be regarded as strategic drivers of sustainable revenue growth and competitive advantage. Consequently, this study provides both theoretical and managerial contributions for firms seeking to strengthen online sales performance and long-term competitiveness in increasingly digitalized and AI-driven business environments.

Limitations of the Study

Notwithstanding its contributions, this study is subject to several limitations that should be acknowledged. First, the research focuses primarily on perceptual and operational factors such as e-service quality, technology, logistics support, and social influence, while financial variables (e.g., inventory turnover and working capital management) are not directly incorporated into the empirical model. As a result, the financial dimension of online sales performance remains only indirectly addressed.

Second, the study is based on cross-sectional survey data, which limits the ability to examine temporal variations in consumer behavior and firm performance. This limitation is particularly relevant in rapidly evolving digital and AI-enabled business environments, where technological advances and market dynamics may continuously reshape consumer preferences and organizational outcomes.

Third, the sample is concentrated within the refrigeration and electronics sector in Vietnam; this may constrain the external validity of the findings and limit their applicability to other industries, market settings, or international contexts.

Future Research Directions

Future research should extend the current model by integrating financial variables, such as inventory turnover, working capital efficiency, and cost-to-serve, to develop a deeper understanding of the interplay between operational performance and financial outcomes. This is particularly important in sectors characterized by high-value products and complex logistics requirements.

In addition, longitudinal studies are recommended to examine how digital transformation and AI adoption influence online sales performance over time. Such approaches would provide deeper insights into causal relationships and the sustainability of firm performance.

Finally, future studies may expand the research scope to include cross-country comparisons or multi-sector analyses, thereby enhancing the external validity of the findings and contributing to the broader literature on financial and operational performance in digital commerce.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ЧИННИКИ, ЩО ВПЛИВАЮТЬ НА РЕЗУЛЬТАТИ ОНЛАЙН-ПРОДАЖІВ У СЕКТОРІ ХОЛОДИЛЬНОЇ ПРОМИСЛОВОСТІ ТА ЕЛЕКТРОНІКИ: ФІНАНСОВІ ТА ОПЕРАЦІЙНІ ДАНІ ВІД КОМПАНІЙ В ЕПОХУ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ ТА ШТУЧНОГО ІНТЕЛЕКТУ

У цьому дослідженні розглянуто ключові чинники, що впливають на результати онлайн-продажів у в'єтнамській холодильній промисловості й електроніці в контексті цифрової трансформації та зростання впровадження технологій штучного інтелекту (ШІ). Спираючись на теорію якості послуг, теорію прийняття технологій і теорію соціального впливу, дослідження розробляє інтегровану рамку для вивчення того, як якість електронних послуг, підтримка технологій і логістики, а також соціальний вплив впливають на результати продажів.

У роботі застосовано кількісний дослідницький дизайн, у якому дані зібрані від клієнтів, які мають досвід онлайн-купівлі дорогих товарів. Надійність і достовірність вимірювальних шкал оцінювали за допомогою альфа- та експлораційного факторного аналізу Кронбаха (EFA), а для вивчення запропонованих зв'язків застосовували множинний

регресійний аналіз. Результати показують, що всі три фактори мають значний позитивний вплив на результати онлайн-продажів, причому якість електронних послуг є найвпливовішим чинником. Технічна та логістична підтримка також відіграють ключову роль, особливо в забезпеченні своєчасної доставки, установлення та післяпродажного обслуговування. Соціальний вплив, що відображається через онлайн-відгуки та рекомендації, додатково формує рішення про покупку в цифровому середовищі. Важливо: результати підкреслюють, що результати онлайн-продажів у цьому секторі визначаються не лише цифровими платформами, а й інтегрованими операційними та сервісними системами, які безпосередньо впливають на фінансові результати включно з ефективністю витрат і стабільністю доходів.

Дослідження збагачує існуючу літературу, поширюючи емпіричні дані з економіки, що розвивається, і надає практичні інсайти для компаній, які прагнуть покращити результати онлайн-продажів у дедалі більш цифровізованому та керованому ШІ бізнес-середовищі.

Ключові слова: бухгалтерський облік, фінанси, бізнес-ефективність, економіка, штучний інтелект (ШІ), цифрова трансформація, індустрія споживчої електроніки, прибуток

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