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The impact of digital supply chain efficiency on customer satisfaction: A study of a sample of online stores

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Abstract :

This study aims to examine the impact of digital supply chain efficiency on customer satisfaction among Algerian consumers, using a quantitative survey approach targeting users of major international e-commerce platforms such as Shein, Temu, AliExpress, and others. Digital transformation in supply chains has become a strategic determinant of competitive advantage, with organizations increasingly relying on technologies such as artificial intelligence, the Internet of Things, big data analytics, and intelligent automation to enhance transaction speed, reduce costs, and improve the accuracy of logistics operations.

Based on the existing literature, digital supply chain efficiency is expected to be positively associated with customer satisfaction through several mechanisms, including reduced delivery times, improved order-tracking transparency, enhanced after-sales services, and increased trust in electronic transactions. Accordingly, this study empirically investigates these relationships using survey data to assess consumers' perceptions of service quality and satisfaction in the context of e-commerce platforms. The findings are expected to highlight the role of digital supply chain efficiency as a key driver of customer satisfaction and sustainable competitiveness in the contemporary digital business environment.

KeyWords: *digital supply chains; customer satisfaction; online stores; Perceived Service Quality*

JelClassification Codes: L86; M15 ; L91 ; M31 ; O33 ; D12.

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1. Introduction

The rapid expansion of e-commerce has fundamentally transformed the way organizations create and deliver value to customers. In digital business environments, customer satisfaction is no longer determined solely by product characteristics or price competitiveness, but increasingly depends on the efficiency of digital processes that support order fulfillment, delivery, communication, and service responsiveness. Consequently, digital supply chains have emerged as a critical organizational capability that enables firms to improve operational performance while enhancing customer experiences and perceptions of service quality)ivanov ؛2021 ،Roh ، Digital transformation of supply chains and customer value creation(2021 ،.

Digital supply chain efficiency refers to the ability of organizations to utilize digital technologies, real-time information sharing, process integration, and data-driven decision-making to optimize supply chain activities and deliver products and services effectively. Recent studies suggest that digitalization enhances supply chain visibility, responsiveness, and reliability, thereby improving organizational performance and customer-related outcomes (li, 2023; wang, 2024). In online retail environments, where customers have limited physical interaction with sellers, efficient digital supply chain processes become particularly important in shaping customer evaluations and post-purchase experiences.

At the same time, perceived quality remains one of the most influential determinants of customer satisfaction. According to service quality theory, customers evaluate service performance based on their perceptions of reliability, assurance, responsiveness, and other quality-related attributes, which subsequently influence their satisfaction judgments (parasuraman, zeithaml, & malhotra, 2005; Zeithaml, Parasuraman, & Malhotra, 2002). Previous research has consistently demonstrated that higher levels of perceived quality contribute to greater customer satisfaction and favorable behavioral outcomes in online shopping contexts (Rita, , Oliveira, & Farisa, 2019; Kim & Yang, 2025).

Although prior studies have independently examined the effects of digital supply chain capabilities and service quality on customer outcomes, limited attention has been given to understanding the mechanism through which digital supply chain efficiency influences customer satisfaction. In particular, the mediating role of perceived quality remains insufficiently explored in the context of online stores operating in emerging digital markets. This gap is especially relevant in Algeria, where e-commerce adoption has increased considerably in recent years, creating a need for empirical evidence regarding the factors that shape customer satisfaction in digital purchasing environments.

Therefore, this study investigates the direct effect of digital supply chain efficiency on customer satisfaction and perceived quality, as well as the effect of perceived quality on customer satisfaction. Furthermore, the study examines the mediating role of perceived quality in the relationship between digital supply chain efficiency and customer satisfaction among Algerian consumers of online stores. By doing so, the study contributes to the growing literature on digital supply chain management and customer behavior while providing practical insights for online retailers seeking to improve customer experiences and satisfaction. Therefore, the main issue is the following question: **To what extent does digital supply chain efficiency affect customer satisfaction among Algerian consumers of online stores?**

1.1. Study questions and hypotheses:

•**Sub-questions**:

In order to answer the problem, it is broken down into the following sub-questions:

-Is there a statistically significant impact of digital supply chain efficiency on customer satisfaction from the perspective of Algerian consumers?

- Is there a statistically significant impact of digital supply chain efficiency on perceived quality from the perspective of Algerian consumers?

-Is there a statistically significant impact of perceived quality on customer satisfaction from the perspective of Algerian consumers?

- Is there a statistically significant indirect impact of digital supply chain efficiency on customer satisfaction through perceived quality in the e-stores studied from the perspective of Algerian consumers?

•**Hypotheses:**

In order to answer the research question and sub-questions, we propose the following hypotheses:

H1: Digital supply chain efficiency has a positive and significant impact on customer satisfaction among Algerian consumers of online stores.

H2: Digital supply chain efficiency has a positive and significant impact on perceived quality among Algerian consumers of online stores.

H3: Perceived quality has a positive and significant impact on customer satisfaction among Algerian consumers of online stores.

H4: Perceived quality has a significant indirect impact on the relationship between digital supply chain efficiency and customer satisfaction among Algerian consumers of online stores.

1.2. Significance of the study:

The significance of this study lies in its examination of a highly relevant and contemporary issue that is encountered daily in the field of e-commerce. Its importance is further reinforced by its attempt to contextualize the topic within the Algerian environment, particularly by exploring ways to develop and strengthen this sector in order to make the purchasing process for Algerian consumers more seamless, secure, and reliable. In this regard, the study highlights the critical role of digital transformation in enhancing supply chain efficiency, while also clarifying the relationship between service quality and customer satisfaction in the context of e-commerce. It further draws on the pioneering experience of e-commerce platforms as a model that can be replicated in other business environments. In addition, the study contributes to a better understanding of customers' perceptions of service quality and provides practical insights that can assist organizations in developing digital strategies aimed at enhancing customer loyalty and competitiveness.

1.3. Study objectives

This section presents the main objectives of the study, which are derived from the research problem and guide the empirical investigation. These objectives focus on examining the role of digital

supply chain efficiency in shaping service outcomes and customer perceptions within the context of e-commerce platforms. The study aims to:

- Analyze the practices of the e-stores under study in the field of digital supply chain management.
- Measure the impact of digital supply chain efficiency on service speed, quality, and transparency.
- Clarify the relationship between operational efficiency and customer satisfaction through the assessment of perceived service quality.
- Propose an explanatory model linking digital supply chains to customer satisfaction, with perceived service quality as a mediating variable.

1.4.Methodology and tools:

This study adopts a deductive research approach, grounded in established theoretical frameworks and prior empirical evidence, with the aim of empirically testing a set of predefined hypotheses concerning the relationships among digital supply chain efficiency, perceived quality, and customer satisfaction in the context of online retailing. Specifically, the study examines both the direct effect of digital supply chain efficiency on customer satisfaction and its indirect effect through perceived quality as a mediating construct. Perceived quality is operationalized as a multidimensional construct encompassing four key dimensions: tangibility, reliability, assurance, and empathy.

A quantitative research design was employed, using a cross-sectional survey strategy to collect primary data. Data were gathered through a structured questionnaire administered to Algerian consumers who had prior experience purchasing products or services from online stores. Respondents were selected using a convenience sampling technique, based on their accessibility and voluntary willingness to participate, which is commonly used in exploratory behavioral research where access to a complete sampling frame is limited.

The measurement and structural models were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), implemented through SmartPLS4 software. This analytical technique was chosen due to its suitability for complex predictive models involving latent constructs, mediating relationships, and non-normal data distributions.

1.5. Study themes:

The study themes were divided as follows:

- Introduction: including the problem statement, sub-questions, hypotheses, importance and objectives of the study, methodology, and tools;

- First axis: Review of previous research and theoretical literature on the study variables;

- Second axis: Methodological procedures for the field study;

- Third axis: Presentation and analysis of the study results and testing of hypotheses;

- Conclusion including the most important findings, recommendations, and proposals.

2. Review of previous knowledge efforts and theoretical literature on the study variables.

Researchers across various disciplines, including business administration and service marketing, have extensively examined the topic of digital transformation, which has brought about fundamental changes in the business environment and has affected all organizational activities and operations. This transformation has been driven by the need to leverage scientific and technological advancements to achieve strong competitive positioning, particularly through the digitalization of supply chains. Such objectives can only be realized by focusing on the most critical element with which organizations interact, regardless of their nature, namely the customer.

Accordingly, researchers have placed considerable emphasis on studying customer satisfaction and identifying the factors that contribute to its enhancement. Among these factors, perceived service quality is widely recognized as a key determinant. In this section, we review the most relevant studies addressing this topic, with the aim of enriching the theoretical foundation of the research, identifying existing research gaps, and presenting the theoretical frameworks underlying the study variables.

2.1. Presentation and analysis of previous knowledge efforts.

- Study (parasuraman, zeithaml, & malhotra, 2005)entitled: E-S-QUAL: A multiple-item scale for assessing electronic service quality.

The study developed and validated a model for measuring electronic service quality. It identified key dimensions such as reliability, responsiveness, assurance, and empathy, and demonstrated their strong influence on customer satisfaction in digital environments.

- Study (Carlson, 2011)entitled: Antecedents of successful e-service quality in online environments.

The study examined the determinants of e-service quality and their impact on customer satisfaction. Using empirical analysis, it found that perceived service quality is a key predictor of satisfaction and behavioral intention in digital platforms.

- Study (Rita, , Oliveira, & Farisa, 2019) entitled: The impact of e-service quality and customer satisfaction on customer behavior in online shopping.

The study analyzed the relationship between service quality, customer satisfaction, and behavioral intentions. The findings confirmed that perceived service quality is the strongest determinant of customer satisfaction and loyalty in e-commerce contexts.

- Study (choi, 2020)entitled: Logistics and service innovation during COVID-19.

The study investigated the role of data-driven logistics systems in improving supply chain responsiveness and reliability. The findings revealed that enhanced logistics performance significantly contributes to customer satisfaction in e-commerce environments.

- Study (ivanov, queiroz, dolgui, & wamba, 2020) entitled: Digital Supply Chain Efficiency and Industry 4.0 Integration

The study aimed to conceptualize the role of digital supply chain efficiency in modern supply chain environments using advanced technologies such as AI, IoT, blockchain, and big data analytics. The authors adopted a theoretical approach and concluded that digital supply chain technologies significantly enhance transparency, responsiveness, and operational efficiency, which are essential for improving supply chain performance.

- Study (ivanov, 2021) entitled: Digital supply chain management and technology to enhance resilience by building and using end-to-end visibility during the COVID-19 pandemic.

The study examined how digital supply chain systems improve resilience and reduce disruptions. Using a conceptual and analytical approach, the findings showed that digital supply chain efficiency enhances customer experience indirectly through improved visibility, reliability, and disruption management.

- Study (Roh , 2021) entitled: Digital transformation of supply chains and customer value creation.

The study explored how digital transformation in supply chains contributes to customer value. The results indicated that the impact of digital supply chain capabilities is indirect and mediated through service quality and value creation mechanisms.

- Study (wamba, 2021)entitled: Big data analytics and supply chain performance.

The study investigated the impact of big data analytics on supply chain performance. The findings revealed that data-driven capabilities improve responsiveness and decision-making, which indirectly affect customer outcomes through enhanced service quality.

- Study (Al-Jadida and Mahmoud, 2022) entitled: "The Level of Electronic Supply Chain Management Implementation and Its Impact on Customer Satisfaction in Jordanian Electronic Food Industry Companies" aimed to determine the level of electronic supply chain management implementation measured by (supply chain coordination and integration; supply chain programs and skills; use of the Internet; collaborative planning) in three Jordanian electronic companies in the food industry, and its impact on customer satisfaction (product quality; time reduction; cost), the researchers followed a descriptive analytical approach and relied on questionnaires as the primary tool for data collection. A total of 152 questionnaires were distributed to managers at these companies, of which 109 were recovered and suitable for analysis. The study concluded that the level of e-supply chain management implementation was high in the companies under study, and that it had an impact on customer satisfaction. The study recommends that these companies continue to implement e-supply chain management.
- Study (kumar, 2022)entitled: System and service quality influence on customer satisfaction and behavioral intention in digital platforms.

The study examined how system quality and service quality influence customer satisfaction. The results showed that perceived service quality acts as a mediating mechanism between system performance and customer behavioral outcomes.

- Study (sharma, 2022) entitled: Artificial intelligence in logistics and supply chain management.

The study analyzed the role of artificial intelligence in logistics optimization. The findings indicated that AI improves operational efficiency and responsiveness, but customer satisfaction is achieved indirectly through perceived service quality.

- Study (li, 2023)entitled: Supply chain digitalization and performance: A moderated mediation model.

The study examined the impacts of supply chain digitalization on performance outcomes. The findings showed that the relationship is indirect and operates through mediating mechanisms such as visibility and responsiveness.

- Study (wang, 2024) entitled: Supply chain digitalization and performance: A moderated mediation of supply chain visibility and survivability.

The study investigated how digital transformation influences performance outcomes. The results confirmed that the impact is fully mediated by visibility and survivability, supporting the importance of mediating variables.

- Study (Ben Skhal and Hassani, 2024) entitled: "E-commerce and digital supply chains – the case of Shein." The researchers aimed to identify the relationship between e-commerce and digital supply chains at the Chinese company Shein and to apply this to the Algerian context. To this end, they used a descriptive approach. The study found a positive complementary relationship between the study variables and proposed the adoption of two e-commerce systems, one focused on local supply and aimed at small businesses, and the other international, focused on large businesses around the world.

- study (Ben Hamlaoui, 2025) entitled: "The impact of digital experience on customer satisfaction - a field study on users of e-shopping sites," the researcher aimed to shed light on the impact of the quality of the digital experience in its dimensions (ease of use, quality of information, customer service, security and trust, payment and delivery, interaction and personalization) on customer satisfaction, using a descriptive analytical approach. An electronic questionnaire was used to collect data from a sample of 139 users of e-shopping sites. The study reached an important conclusion that the quality of the digital experience in its various dimensions has a positive impact on customer satisfaction and recommends the development of more efficient electronic payment systems to facilitate the purchasing process for Algerian consumers through websites.

Research Gap and Contribution of the Current Study:

The current study is different from previous studies because it focuses directly on the impact of digital supply chain efficiency on customer satisfaction in online stores from the consumer perspective. In contrast, most previous studies focused on supply chain performance, organizational outcomes, or used other variables such as service quality, visibility, and responsiveness as mediators. They were also mainly conducted in business-to-business or company-level contexts.

However, the current study focuses on a business-to-consumer context and examines customers' perceptions directly. It also tests the direct relationship between digital supply chain efficiency and customer satisfaction in e-commerce platforms. Therefore, this study provides a new contribution by focusing on the final customer instead of organizational processes.

2.2. Theoretical literature on study variables

This section is dedicated to identifying the theoretical foundations of the study variables. It begins with an examination of supply chains and their digital transformation in a context that requires continuous adaptation to rapid technological developments. It then addresses perceived service quality and its measurement models. Finally, it presents the concept of customer satisfaction and its key dimensions.

2.2.1. Digital supply chains

Supply chains refer to all activities related to the flow of products and information from the supplier (supply sources) to the consumer or end customer (Hamed, Abdel Fattah, and Hamdi, 2022, p. 5). They are also defined as "a network of independent organizations collectively responsible for the activities of procurement, production, and distribution associated with a family of products, starting with suppliers and ending with the final consumer" (Aqasim and Ben Obeid, 2015, p. 18). In addition, a supply chain is described as a system composed of suppliers, manufacturers, distributors, and customers, where materials flow from suppliers to customers, while information flows in all directions. It is further conceptualized as a network of partners or business entities, including facilities, infrastructure, and distribution channels, that transform raw inputs into finished products and deliver them to customers. This system comprises three main streams: physical logistics, financial flows, and information flows (Ben Skhal and Hassani, 2024, p. 149).

Based on the above definitions, several key observations can be made. First, supply chains encompass most of the activities involved in transforming inputs into outputs. Second, they connect multiple actors, ranging from suppliers to end customers. Third, they involve three main types of

flows: physical flows (movement of raw materials and products), financial flows (payments and funding related to transactions), and information flows, which ensure coordination across all stages of production, distribution, and delivery.

Accordingly, supply chains can be defined operationally as a set of interconnected entities working together to produce a product or group of products, starting from suppliers and manufacturers and extending to the final customer, with continuous flows of physical goods, financial resources, and information moving in both directions between suppliers and customers.

With the evolution of the business environment and the increasing integration of technology across all operational stages, supply chains have been significantly affected by digital transformation. As a result, they are progressively transitioning from traditional systems to digital supply chains.

Continuous advances in computing and digital technologies are transforming markets, economies, businesses, and society, thereby generating profound changes in supply chain management and business operations (Zhang, MacCarthy, & Ivanov, 2022, p. 77). This development has resulted in a shift from traditional supply chains to digital supply chains, which are defined as supply chains that leverage digital technologies and data analytics to support decision-making, enhance performance, and respond rapidly to changing conditions. At their core, digital supply chains are driven by data generated across supply chain activities, which is stored in data repositories and analyzed to generate actionable insights.

The importance of digital supply chains is expected to continue growing in the coming years. According to Grand View Research, the global supply chain management market was valued at $23.26 billion in 2023 and is projected to reach $48.6 billion by 2030, with an average annual growth rate of 11.2% between 2024 and 2030 (Coursera Staff, 2025).

This development in supply chain management is achieved using three basic tools and specialized programs, which we summarize in the following table:

Table 1: Digital supply chain management tools and software

TOOL/PROGRAM	**EXPLANATION**
INTERNATIONAL INFORMATION NETWORK "INTERNET"	The development of information networks and their significant entry into the commercial transactions market has helped integrate customers with institutions and institutions with suppliers, as information is vital and its availability with the required credibility positively reflects on business efficiency and, consequently, product quality.
ELECTRONIC DATA INTERCHANGE	This includes: banking transactions; electronic invoices; product inquiries; price catalogs; automated correspondence related to purchasing and sales.
ELECTRONIC BUSINESS	It is defined as "a series of activities that use the Internet or any other electronic medium, consisting of three areas: customer-oriented activities; business-oriented activities; and government-oriented activities, including: -Distribution and delivery of goods and follow-up procedures - Settlement and payment of financial obligations - Conclusion of contracts and transactions - Negotiation and interaction between buyer and

	seller - Customer relations that support sales, purchasing, and after-sales services - Information about goods, merchandise, and services - Advertising of goods, merchandise, and services - Technical support for goods purchased by customers.
SUPPLY CHAIN PLANNING PROGRAM	It aims to improve the flow and efficiency of the supply chain, reduce inventory to a minimum, and relies primarily on accurate information about customer orders, manufacturing capacity, and product delivery capabilities. It includes three sub-programs: -Material Requirements Planning (MRP) program; -Enterprise Resource Planning (ERP) program; -Distribution Requirements Planning Program.
SUPPLY CHAIN EXECUTION PROGRAM	Implementation of various steps for supply chain management. This is done electronically, starting with orders and extending to the suppliers needed to meet manufacturing requirements for products.

Source: (Rifai, 2016, pp. 57–64).

2.2.2. Perceived Service Quality

a. Concept and theoretical origins

Before addressing the definition of perceived service quality, we first refer to the meaning of quality, which can be simply defined as meeting customer requirements. It has been expressed in many ways by leading researchers in the field of quality management, as follows (Oakland, 2014, pp. 4-5) :

" -Conformity of a product to its use" (Juran);

" -The totality of characteristics of a product or service that influence its ability to satisfy stated or implied needs" (ISO 8402.1986);

" -Quality must be aimed at the present and future needs of the consumer" (Deming);

" -The total characteristics of the product and service directed towards marketing, engineering, manufacturing, and maintenance of the product and service used to meet customer expectations" (Feigenbaum);

" -Conformity to customer requirements" (Crosby);

" -The degree to which a set of inherent characteristics fulfills requirements" (ISO 9000 .2000).

Although there is no single universally accepted definition of quality, the above definitions share some common elements (Goetsch& Davis, 2016, p. 3) :

-Quality involves meeting or exceeding customer expectations;

-Quality applies to products, services, processes, people, and environments;

- Quality is a constantly changing state, meaning that what is considered quality today may not be considered quality tomorrow.

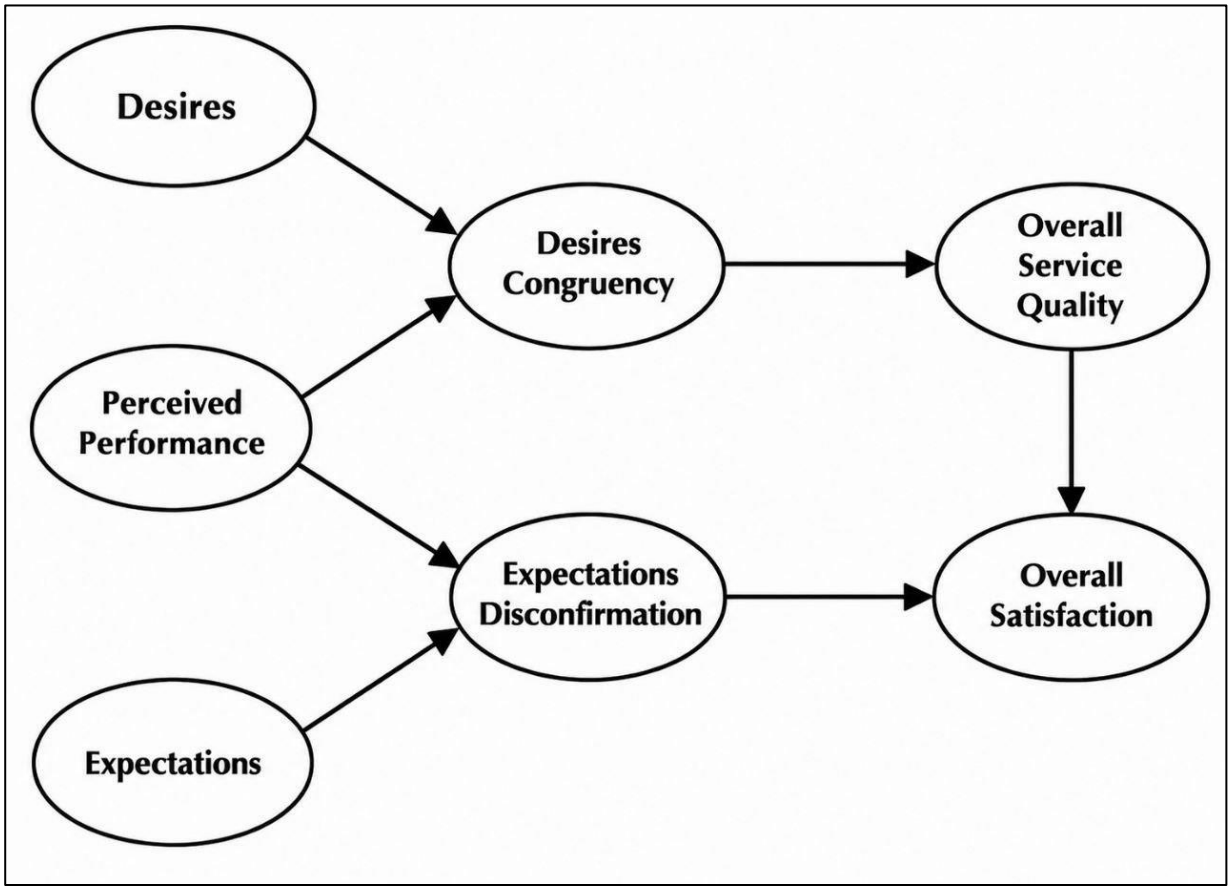
They define it as "a dynamic state associated with products, services, people, processes, and environments that meet or exceed expectations and help produce higher value".

Total quality is a broad approach that encompasses three essential elements of high value: superior quality, superior cost, and superior service (Goetsch& Davis, 2016, p. 3). In other words, organizations must be capable of providing products and services of sufficient quality to meet or exceed customer needs, as customers are the only actors able to determine whether a product truly satisfies their requirements. This also involves attention to cost, meaning the efficient use of available resources to deliver outputs that meet demand at lower cost, as well as superior service in terms of responsiveness, pricing, and other related dimensions.

Salman (2010, pp. 19–20) further argues that total quality is associated with three fundamental dimensions: efficiency, quality of the work environment, and objectives and actions aimed at achieving competitive advantage. This perspective emphasizes efficiency, namely producing outputs of adequate quality while minimizing inputs (lower costs and improved outputs), improving the work environment through strengthening relationships between employees and management, and achieving strategic goals and actions that contribute to long-term competitive advantage.

Regarding service quality, it is not assessed solely through objective measures of service performance; rather, it is primarily determined by customer perceptions, specifically the gap between expectations and perceived performance. This concept is known as perceived service quality and is grounded in the expectation–disconfirmation model, whereby customers compare their prior expectations with the actual service received. Classic studies, such as Spreng and Mackoy (1996), have examined the distinction between service quality and customer satisfaction and provided an empirical framework for the perceived service quality model, which is illustrated in the following figure:

Figure 1: Experimental framework for the perceived quality model



Source: (Spreng & Mackoy, 1996, p. 203)

b. Traditional Service Quality Models and Dimensions

One of the most widely recognized models in this field is the SERVQUAL scale developed by Parasuraman, Zeithaml, and Berry. This model consists of 22 items distributed across five key dimensions: tangibility, reliability, responsiveness, assurance, and empathy.

c. Perceived Service Quality in Digital/Electronic Environments:

With the integration of digital technologies into customer service systems and digital supply chains, the concept of perceived service quality has evolved to incorporate additional dimensions. These typically include efficiency, reliability, security, convenience, and responsiveness.

In this context, a study entitled “Measuring Perceived Service Quality Offline vs. Online” proposed the PeSQ (Perceived Service Quality) model to assess service quality in both offline and online environments, highlighting the complexity of evaluating electronic service quality (Obadă, 2014). Similarly, the study “The Impact of E-Service Quality and Customer Satisfaction on Customer Behavior in Online Shopping” focused on dimensions such as efficiency, reliability, security, fulfillment, and responsiveness, and found that these factors significantly influence customer satisfaction in electronic environments (Paulo, Oliveira, &Farisa, 2019). In addition, the e-service quality model proposed in several studies includes dimensions such as reliability, security, fulfillment, ease of use, and responsiveness, among others (Ayotunde, Omoyele , & Olabode , 2022). Furthermore, Zeithaml, Parasuraman, and Malhotra (2002) also suggest additional dimensions such as privacy and ease of use as important determinants of perceived e-service quality**.**

2.2.3. Customer Satisfaction

a. Concept and Basic Theory

Customer satisfaction is defined as "the evaluation or judgment made by the customer after comparing the service or product received with what was expected. If performance exceeds or meets expectations, satisfaction arises; if it falls short, dissatisfaction arises (Disconfirmation Model)" (Ramasamy et al., 2024).

Some researchers point out that satisfaction is not just a direct result but a dynamic process influenced by antecedents (expectations, perceived value, trust) and subsequent outcomes (loyalty, recommendation) (Stange, Scheffler, & Henseler, 2025).

b.Factors influencing satisfaction

• In the context of digital logistics and delivery services, a study in Jordan showed that e-quality dimensions such as reliability, ease of use, efficiency, privacy, and responsiveness positively affect customer satisfaction, with reliability having the greatest impact (Abusalma, Al- Daoud, Suleiman ,& Vasudevan, 2024):

• In the digital banking context, a study showed that “digital quality” (consisting of system quality, information quality, and service quality) ultimately affects satisfaction, as improving these dimensions increases customer loyalty through higher satisfaction (Kim & Yang, 2025).

• In e-commerce and digital marketing, a study found that satisfaction is also influenced by factors such as perceived value and trust, with satisfaction playing a mediating role between perceived value and loyalty (Yum & Kim, 2024).

2.2.4Digital Supply Chain Efficiency, Perceived Service Quality, and Customer Satisfaction: (Theoretical and Empirical Foundations)

Recent international literature on digital supply chain management (DSCM) consistently highlights its growing role in shaping customer behavior and satisfaction in digital commerce environments. Digital supply chain efficiency (EDSC) refers to the extent to which firms leverage digital technologies such as artificial intelligence, Internet of Things (IoT), big data analytics, blockchain, and automation to optimize logistics performance, enhance transparency, and improve responsivene (ivanov, queiroz, dolgui, & wamba, 2020, p. 1157).

Several empirical studies have demonstrated that DSCM capabilities significantly improve operational performance and customer-facing outcomes. For instance, (ivanov, Digital supply chain management and technology to enhance resilience by building and using end-to-end visibility during the COVID-19 pandemic, 2021, p. 2796)shows that digitally enabled supply chains increase resilience and reduce delivery disruptions, thereby improving customer experience. Similarly, (choi, 2020)emphasizes that data-driven supply chains enhance responsiveness and reliability, which are key determinants of customer satisfaction in e-commerce environments.

From a behavioral perspective, customer satisfaction in digital environments is strongly influenced by perceived service quality. (parasuraman, zeithaml, & malhotra, 2005, pp. 214-220).establish that e-service quality dimensionssuch as reliability, responsiveness, assurance, and empathy—are primary antecedents of satisfaction. In the context of e-commerce platforms, (Carlson, 2011, pp. 460-468). (Rita, , Oliveira, & Farisa, 2019)Confirm that perceived service quality is the most consistent predictor of customer satisfaction and loyalty.

2.2.4.1 Mediation Role of Perceived Service Quality:

Perceived service quality is conceptually positioned as a mediating mechanism between digital supply chain efficiency and customer satisfaction (Roh , 2021, pp. 2-11) While digital supply chain efficiency reflects the technological and operational backbone of service delivery, customers do not directly evaluate backend systems (ivanov, Digital supply chain management and technology to enhance resilience by building and using end-to-end visibility during the COVID-19 pandemic, 2021). Instead, they assess visible outcomes such as delivery speed, order accuracy, tracking transparency, and responsiveness (wamba, 2021, pp. 110-119).

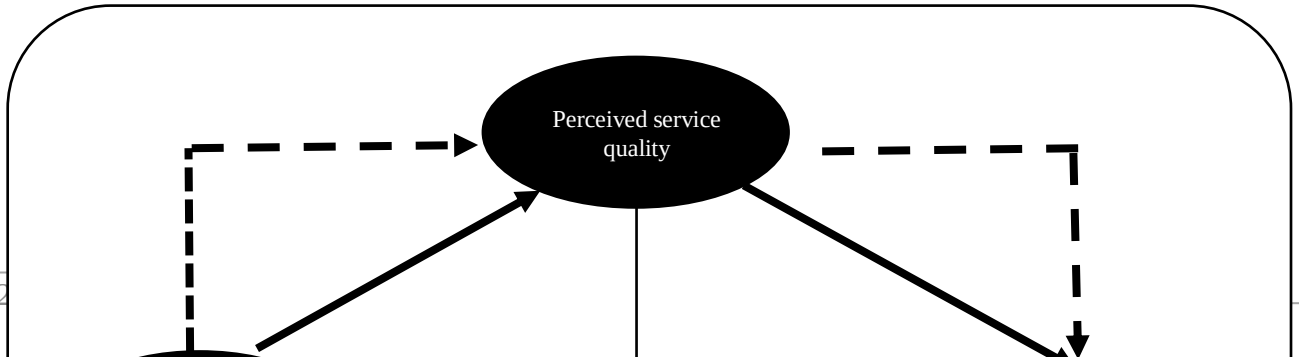
The mediation logic is grounded in the idea that customers evaluate the outcomes generated by digital supply chain capabilities rather than the technologies themselves (kumar, 2022, pp. 210-220).Improvements in logistics automation, real-time information sharing, and predictive analytics enhance perceived service quality, which in turn drives customer satisfaction (sharma, 2022, p. 18) Therefore, the relationship between digital supply chain efficiency and customer satisfaction is largely indirect and operates through perceived service quality (li, 2023).

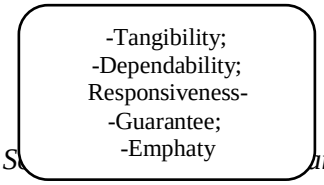
Accordingly, perceived service quality functions as a translation mechanism that converts internal digital supply chain efficiency into externally observable customer evaluations, ultimately enhancing customer satisfaction (wang, 2024).

2.3.Theoretical and hypothetical model of the study

In light of the previous cognitive efforts on the subject of the study and the theoretical rooting of the variables (digital supply chains, perceived service experience, customer satisfaction) and in the context of the proposed problem, we propose the following conceptual model for the study.

Figure 2: Hypothesis model for the study





Source: Researchers

3. Methodological procedures for the field study

This section of the study focuses on determining the sample size and sampling method, the primary data collection instrument and its distribution procedure, as well as the statistical techniques employed to test the study hypotheses.

3.1.Sample and Study Instrument:

The empirical study targets online stores operating on the Internet and promoted through various social media platforms. Given that the variables under investigation are qualitative in nature (digital supply chain efficiency, perceived service quality, and customer satisfaction), an electronic questionnaire was used as the primary data collection instrument. The study targeted Algerian consumers across the country. A total sample of 181 respondents was obtained between August 14, 2025, and the end of September of the same year. Accordingly, a random sampling method was deemed the most appropriate for the nature of this study.

3.2. Statistical Methods Used:

Descriptive statistical methods, including the arithmetic mean and standard deviation, were employed to describe the central tendency and dispersion of respondents' answers to the questionnaire items. To test the study hypotheses and evaluate the proposed structural model, Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied. This choice is justified by the exploratory and prediction-oriented nature of the research, which aims to examine complex relationships among latent constructs rather than confirm an established theory.

PLS-SEM is particularly suitable for models involving multiple latent variables and complex interrelationships, as it focuses on maximizing the explained variance of endogenous constructs. Furthermore, the study adopts a reflective measurement model specification, which is well supported within the PLS-SEM framework. Accordingly, the use of PLS-SEM is appropriate given the study's objective of prediction and theory development rather than strict theory confirmation.

4. Presentation and Analysis of Study Results and Hypothesis Testing

The first part of this section presents the descriptive analysis of the study results in order to identify the trends in respondents' answers to the questionnaire items and dimensions, as well as to describe the characteristics of the study sample. The second part presents the results of structural equation modeling using partial least squares in order to validate the proposed conceptual model and test the study hypotheses.

4.1. Presentation and Analysis of Study Results

This subsection is devoted to describing the characteristics of the study sample (frequencies and percentages), followed by an examination of response trends based on descriptive statistics, namely the mean and standard deviation.

Table 2: Descriptive characteristics of the study sample

Descriptive characteristics		**Repetitions**	**Percentages (%)**
Sex	**male**	**63**	**35**
	female	**117**	**65**
Age	**Lessthan 20**	**0**	**0**
	Between 20 &39 years	**157**	**87 .2**
	40years and above	**23**	**12.8**
The e-store you are dealing with	**Shein**	**22**	**12.2**
	Temu	**10**	**5.6**
	Aliexpress	**78**	**43.3**
	Amazon	**6**	**3.3**
	Jumia	**23**	**12.8**
	Facebook/Instagrame	**5**	**2.8**
Number of purchases in the recentperiod	**From 1 TO 2**	**87**	**48.3**
	From 3 TO 5	**44**	**24.4**
	From 6 TO 10	**11**	**6.1**

	More than 10 times	**38**	**21.1**
Do you buy directly from thewebsite or through an intermediary?	**buy directly from thewebsite**	**117**	**65.0**
	through an intermediary	**63**	**35.0**

Source : Smartpls4 outputs.

-Female respondents represented the majority of the sample, accounting for 65% (117 respondents), while males constituted the remaining 35%. This distribution indicates a greater participation of females in the survey and should be considered when interpreting the study findings.

-The dominant age group was 20–39 years, representing 87.2% of the sample (157 respondents), while respondents aged over 40 accounted for 12.8%. No participants were under the age of 20. This distribution suggests that the study findings primarily reflect the perceptions and experiences of young and middle-aged adults who are active users of online shopping platforms.

-Regarding preferred online stores, AliExpress was the most frequently used platform, reported by 43.3% of respondents (78 individuals). Jumia and Shein followed with 12.8% and 12.2%, respectively, while the remaining platforms accounted for relatively small proportions. These findings indicate that AliExpress occupies a prominent position among the online shopping platforms used by the surveyed consumers. In addition, 34 respondents reported using more than one online store.

-Regarding the number of purchases made in the recent period, extending to a month or two at most, we note that the predominant category of respondents is (one to two times) with 48.3%, followed closely by (three to five times) with 24.4%, then (more than 10 times) with 21.2%. Finally, the category of (6 to 10 times) accounted for 6.1%. We explained this by the fact that shopping through online stores is still new to Algerian consumers, who are not accustomed to it, and it has only recently become widespread.

-Concerning purchase frequency during the previous one to two months, the largest group of respondents reported making one to two purchases (48.3%), followed by three to five purchases (24.4%), more than ten purchases (21.2%), and six to ten purchases (6.1%). These results suggest that online purchasing activity varies across respondents, with occasional purchasing being the most common pattern.

-Most respondents (65%) reported purchasing directly through online store websites, whereas 35% relied on intermediaries. This finding indicates that direct purchasing is the predominant approach among the surveyed consumers, although a considerable proportion still prefers intermediary-assisted transactions.

Table 3: Trends in the responses of the study sample

	N	Minimum value	Maximum value	Mean	STDV
	EDSC				
EDSC 1	180	1.0	5.0	3,8	0,8806
EDSC2	180	1.0	5.0	3,4	1,1116
EDSC 3	180	1.0	5.0	3,589	1,0072
EDSC 4	180	1.0	5.0	3,233	0,9978
EDSC 5	180	1.0	5.0	3,117	1,0154
EDSC 6	180	1.0	5.0	3,794	0,9955
EDSC 7	180	1.0	5.0	3,539	1,0537
EDSC 8	180	1.0	5.0	3,817	1,0274
	PerSerQua				
Tang1	180	1.0	5.0	3,911	1,0209
Tang2	180	1.0	5.0	3,739	1,1003
Tang3	180	1.0	5.0	3,389	1,2569
Depend1	180	1.0	5.0	3,711	1,0543
Depend2	180	1.0	5.0	3,639	1,0663
Depend3	180	1.0	5.0	3,428	0,9156
Response1	180	1.0	5.0	3,156	1,0074
Response2	180	1.0	5.0	2,75	0,8836
Response3	180	1.0	5.0	2,856	0,7704
Guarantee1	180	1.0	5.0	3,889	0,9796
Guarantee2	180	1.0	5.0	3,544	0,9878
Guarantee3	180	1.0	5.0	3,667	1,0934
Empathy1	180	1.0	5.0	3,594	0,7889
Empathy2	180	1.0	5.0	3,683	1,0489

Empathy3	**180**	**1.0**	**5.0**	**3,583**	**0,9147**
Empathy4	**180**	**1.0**	**5.0**	**3,561**	**0,9523**
	CusSat				
CusSat1	**180**	**1.0**	**5.0**	**3,861**	**1,0451**
CusSat2	**180**	**1.0**	**5.0**	**3,911**	**0,9705**
CusSat3	**180**	**1.0**	**5.0**	**4,056**	**0,8952**
CusSat4	**180**	**1.0**	**5.0**	**3,511**	**1,1261**
CusSat5	**180**	**1.0**	**5.0**	**3,911**	**1,0264**
CusSat6	**180**	**1.0**	**5.0**	**3,9**	**0,9978**

Source : Smartpls4 outputs.

Regarding the items measuring the variable *digital supply chain efficiency*, the results indicate that most respondents tended to agree. The mean values ranged from 3.117, which reflects a neutral response for only two items, to 3.810 for the remaining items, which falls within the agreement category.

For the items and dimensions of the variable *perceived service quality*, the findings similarly show that most respondents expressed agreement. The mean values ranged between 2.750 for items 2 and 3, while most of the remaining items exceeded 3.39, reaching a maximum value of 3.911. This indicates that the majority of respondents agreed with the statements measuring this variable.

With regard to *customer satisfaction*, all items reflect a general tendency toward agreement, with mean values ranging from 3.511 to 4.056.

Regarding the standard deviation values, they are relatively high, indicating a moderate level of dispersion in respondents' answers. This variation can be explained by differences in individual customer experiences with the online stores under study. As a result, complete consensus cannot be expected across all questionnaire items, since each respondent evaluates the service based on their own purchasing experience and personal perceptions.

4.2. Structural Equation Modeling Using Partial Least Squares (PLS-SEM)

After describing the general characteristics of the study sample and identifying response trends across the questionnaire items and dimensions, the analysis proceeds to the next stage. This stage is considered one of the most important, as it involves testing the study's conceptual model and evaluating the proposed hypotheses in order to address the research problem. To this end, the analysis proceeds sequentially by first assessing convergent validity, then discriminant validity, and finally presenting the results of the structural model.

4.2.1. Convergent Validity Assessment

The convergent validity assessment examines the extent to which the observed indicators converge to measure the same underlying construct within the proposed measurement model. The results of this assessment are presented in the following table:

Table 4: Convergent validity test results

Latent Variables	Measuredindicators	Loading	Cronbach's alpha	CR	AVE	VIF
EDSC	**EDSC 1**	**0.777**				2.463
	EDSC2	**0.844**				3.027
	EDSC 3	**0.768**	**0.895**	**0.906**	**0.581**	3.194
	EDSC 4	**0.696**				2.959
	EDSC 5	**0.750**				3.364
	EDSC 6	**0.780**				2.811
	EDSC 7	**0.597**				3.448
	EDSC 8	**0 .853**				2.547
PerSerQua	**Tang1**	**0.835**				4.911
	Tang2	**0.749**				5.003
	Tang3	**0.771**				3.389
	Depend1	**0.802**				3.586
	Depend2	**0.792**				2.823
	Depend3	**0.706**	**0.961**	**0.965**	**0.632**	3.115
	Response1	**0.816**				4.494
	Response2	**0.719**				3.576
	Response3	**0.749**				4.779
	Guarantee1	**0.900**				3.023
	Guarantee2	**0.865**				3.360
	Guarantee3	**0.855**				3.112
	Empathy1	**0.827**				2.207
	Empathy2	**0.760**				2.858

	Empathy3	**0.673**				3.383
	Empathy4	**0.860**				3.626
CusSat	**CusSat1**	**0.935**				4.406
	CusSat2	**0.914**				4.650
	CusSat3	**0.924**	**0.951**	**0.956**	**0.805**	2.907
	CusSat4	**0.854**				3.370
	CusSat5	**0.907**				2. 968
	CusSat6	**0.844**				3.752

Source : Smartpls4 outputs.

With regard to the factor loadings, most indicators exceeded the recommended threshold of 0.70 and are therefore considered acceptable. However, three items fall below this criterion: efficiency S4 (0.696), efficiency S7 (0.597), and empathy3 (0.673).

The composite reliability (CR) values are well above the threshold of 0.70 for all constructs, indicating strong internal consistency reliability across the three variables.

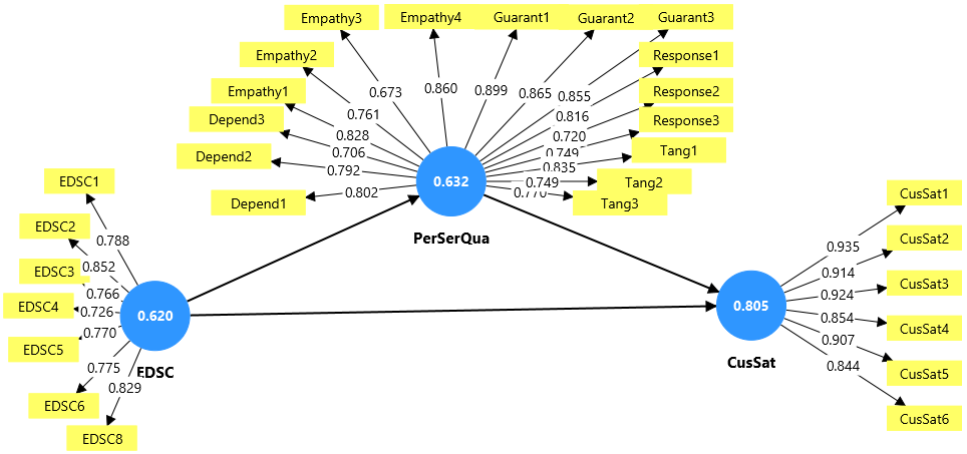
Similarly, the Average Variance Extracted (AVE) values exceed the minimum acceptable level of 0.50. They are therefore considered acceptable for the digital supply chain efficiency construct (0.581), good for the perceived service quality construct (0.638), and excellent for the customer satisfaction construct (0.805).

In addition, the Variance Inflation Factor (VIF) values are below 5 for all variables, indicating that multicollinearity is not a concern in the measurement model.

Overall, these results confirm the reliability and validity of the measurement instrument and its consistency with the proposed model. The researchers initially decided to retain all items with factor loadings below 0.70, as their inclusion did not negatively affect composite reliability or AVE values.

However, following Hair et al. (2017), indicators with loadings below 0.70 were further examined. Accordingly, EDSC7 (0.597) was removed due to its low loading and limited theoretical justification. After its removal, the measurement model demonstrated improved reliability and convergent validity, as reflected in satisfactory CR and AVE values. Specifically, all remaining indicators exhibited loadings above the recommended threshold of 0.70. In addition, the AVE increased from 0.581 to 0.620, while the composite reliability remained stable at approximately 0.905. These improvements are illustrated in the following figure:

Figure 3: PLS-SEM results after removing EDSC7



Source : Smartpls4 outputs.

4.2.2. Discriminant Validity Test

Discriminant validity testing assesses the extent to which the questionnaire items and dimensions are distinct in representing their respective latent variables. In other words, it examines whether each set of indicators reflects its associated latent construct more strongly than it does any other construct in the model, thereby evaluating the degree of overlap between constructs. The following table presents the results of the discriminant validity assessment based on cross-loadings.

Table 5: Results of the discriminant validity test (cross loadings)

Latent Variables	Measuredindicators	EDSC	PerSerQua	CusSat
EDSC	**EDSC 1**	**0.788**	0.645	0.644
	EDSC2	**0.852**	0.719	0.738
	EDSC 3	**0.766**	0.663	0.741
	EDSC 4	**0.726**	0.647	0.498
	EDSC 5	**0.770**	0.556	0.470
	EDSC 6	**0.775**	0.555	0.484
	EDSC 8	**0.829**	0.675	0.687
PerSerQua	**Tang1**	0.646	**0.835**	0.767
	Tang2	0.534	**0.749**	0.687
	Tang3	0.623	**0.770**	0.698
	Depend1	0.628	**0.802**	0.677
	Depend2	0.658	**0.792**	0.786
	Depend3	0.777	**0.706**	0.690
	Response1	0.680	**0.816**	0.653

	Response2	0.491	**0.720**	0.526
	Response3	0.600	**0.749**	0.588
	Guarantee1	0.751	**0.899**	0.851
	Guarantee2	0.706	**0.865**	0.804
	Guarantee3	0.766	**0.855**	0.801
	Empathy1	0.743	**0.828**	0.732
	Empathy2	0.518	**0.761**	0.631
	Empathy3	0.357	**0.673**	0.585
	Empathy4	0.716	**0.860**	0.837
CusSat	**CusSat1**	0.762	0.870	**0.935**
	CusSat2	0.727	0.855	**0.914**
	CusSat3	0.663	0.829	**0.924**
	CusSat4	0.784	0.823	**0.854**
	CusSat5	0.717	0.792	**0.907**
	CusSat6	0.564	0.636	**0.844**

Source : Smartpls4 outputs.

All measured indicators load more strongly on their respective underlying constructs than on other constructs, indicating adequate discriminant validity. For instance, the item "Efficiency S6" exhibits a loading of 0.775 on the construct *digital supply chain efficiency*, compared to lower cross-loadings of 0.555 on *perceived service quality* and 0.484 on *customer satisfaction*.

A similar pattern is observed across the remaining questionnaire items and dimensions, confirming that each indicator is more strongly associated with its intended latent variable than with other constructs in the model. This provides evidence that the constructs are empirically distinct and appropriately measured.

In the subsequent step, the linear relationships among the constructs are examined, and the results are presented in the following table:

Table 6: Fornell and Larcker test

	CusSat	EDSC	PerSerQua
CusSat	0.897		
EDSC	0.789	0.788	
PerSerQua	0.899	0.815	0.795

Source : Smartpls4 outputs.

Discriminant validity was further evaluated using the Fornell–Larcker criterion. As presented in Table 6, the square roots of the AVE values are reported on the diagonal of the correlation matrix.

Although these diagonal values are generally high, some inter-construct correlations are comparable to, or slightly higher than, the corresponding square roots of AVE, particularly between *Perceived Service Quality* and *Customer Satisfaction*. This suggests that the Fornell–Larcker criterion does not fully confirm discriminant validity for all constructs in the model.

Given the well-documented limitations of the Fornell–Larcker criterion in detecting discriminant validity issues, an additional assessment was conducted using the Heterotrait–Monotrait (HTMT) ratio, which is considered a more robust and reliable approach in PLS-SEM studies.

Table 7: HTMT Ratio

	CusSat	EDSC	perserqua
CusSat			
EDSC	0,782		
perserqua	0,900	0,839	

Source : Smartpls4 outputs.

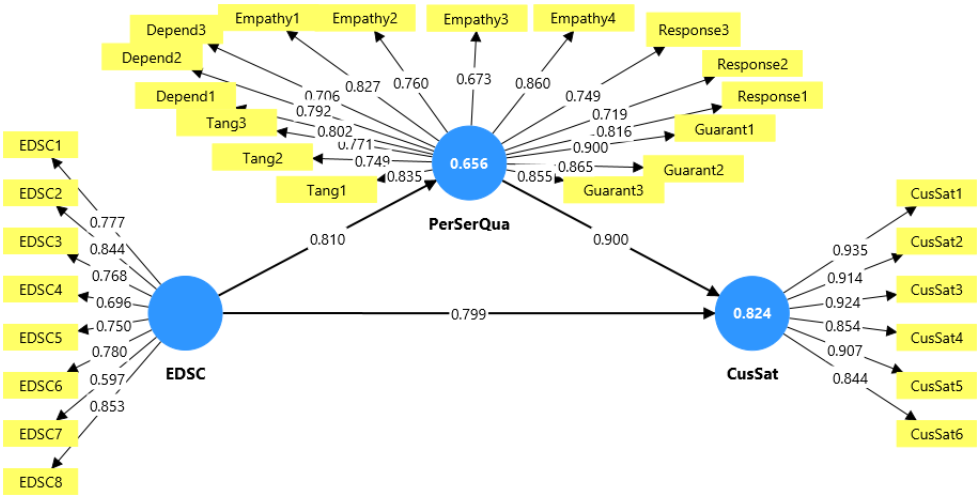
The discriminant validity of the constructs was assessed using the Heterotrait–Monotrait (HTMT) ratio. As shown in Table 7, the HTMT values range from 0.782 to 0.900. Specifically, the HTMT value between *digital supply chain efficiency* and *customer satisfaction* is 0.782, while the value between *digital supply chain efficiency* and *perceived service quality* is 0.839; both remain below the recommended threshold of 0.90. The HTMT value between *perceived service quality* and *customer satisfaction* reaches 0.900, which lies at the upper acceptable limit suggested in the literature. Accordingly, the results provide acceptable evidence of discriminant validity among the study constructs.

The relatively high HTMT value observed between *perceived service quality* and *customer satisfaction* (0.900) can be theoretically justified by the strong conceptual proximity between these two constructs. In the service and marketing literature, perceived service quality is widely recognized as a key antecedent of customer satisfaction, and both constructs are typically formed through closely related cognitive evaluations of service experiences. Consequently, respondents may have difficulty clearly distinguishing between their assessment of service quality and their overall satisfaction, which leads to a higher degree of shared variance between the two constructs (Parasurman, Zeithaml, & Berry, 1988; Cronin & Taylor, 1992). This conceptual overlap is particularly common in empirical studies conducted in service-based contexts, where customer satisfaction is largely shaped by perceived service performance dimensions(Henseler, Ringle, & Sarstedt, 2015; Hair , Black, Babin, & Anderson, 2019). Accordingly, the slightly elevated HTMT value reflects this inherent theoretical proximity rather than a methodological weakness in the measurement model. Nevertheless, it remains within the acceptable threshold of 0.90 recommended in the PLS-SEM literature.

4.2.3. Structural Equation Modeling (PLS-SEM) Results

After assessing both convergent and discriminant validity and confirming their adequacy, the following figure presents the proposed structural model, illustrating the factor loadings between the latent constructs and their respective observed indicators, as well as the relationships among the latent variables.

Figure 4: PLS-SEM results for the study model



Source: Smartpls4 outputs.

The figure above indicates that the proposed study model is suitable for estimating the relationships among variables and for testing the research hypotheses, both in terms of the measurement model and the structural model. It should be noted that all factor loadings exceeded the recommended threshold of 0.70, with the exception of the previously identified items, which were nevertheless retained and not removed from the analysis.

In greater detail, the following table presents the results of the model's predictive accuracy assessment.

Table 8: Predictive accuracy results for the study model

Latent Variables	R^2	F^2	Q^2
EDSC	///	(1.981)PerSerQua (0.051) CusSat	///
PerSerQua	0.665	(1.077) CusSat	0.657
CustomerSat	0.818	///	0.640

Source : Smartpls4 outputs.

The following observations can be made regarding the table above:

- The coefficient of determination (R^2) for the *perceived service quality* construct (0.665) indicates that 66.5% of its variance is explained by *digital supply chain efficiency*. Similarly, the R^2 value for *customer satisfaction* (0.818) indicates that 81.8% of its variance is jointly explained by *digital supply chain efficiency* and *perceived service quality*. These values are relatively high, reflecting strong explanatory power of the model.
- The effect size (f^2) was assessed in accordance with Cohen's (1988) guidelines, where values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects, respectively. The results show that the effect of *digital supply chain efficiency* on *customer satisfaction* is small ($f^2 = 0.051$), indicating a modest direct contribution when other predictors are included in the model.

In contrast, *perceived service quality* has a very large effect on *customer satisfaction* ($f^2 = 1.077$), far exceeding the threshold for a large effect, which underscores its strong practical importance in explaining customer satisfaction. Likewise, *digital supply chain efficiency* exhibits an extremely

large effect on *perceived service quality* (f^2 = 1.981), suggesting that it is a key determinant of service quality perceptions.

Overall, in line with Cohen's benchmarks (Cohen, 1988), the findings indicate that although the direct effect of *digital supply chain efficiency* on *customer satisfaction* is relatively limited, its overall influence is primarily indirect, operating through *perceived service quality*, which plays a central mediating role in the structural model.

- The predictive relevance of both endogenous constructs (perceived service quality and customer satisfaction) exceeds zero, indicating that the model possesses satisfactory predictive capability.

The following table presents the path coefficients for the direct hypotheses of the study (i.e., excluding the mediating impact).

Table 9: Direct path coefficients for the study hypotheses

	Original sample (O)	Samplemean (M)	STDEV	T statistics	P value
EDSC>PerSerQua	**0.815**	**0.816**	**0.034**	**24.137**	**0.000**
PerSerQua>CusSat	**0.764**	**0.766**	**0.041**	**19.128**	**0.000**
EDSC>CusSat	**0.166**	**0.164**	**0.040**	**3.807**	**0.000**

Source: Smartpls4 outputs.

The bootstrapping results indicate that *perceived service quality* plays a central mediating role in the relationship between *digital supply chain efficiency (EDSC)* and *customer satisfaction*. Specifically, EDSC exerts a strong and statistically significant effect on perceived service quality ($\beta = 0.815$, $p < 0.001$), which in turn has a strong and significant impact on customer satisfaction ($\beta = 0.764$, $p < 0.001$). Although the direct effect of EDSC on customer satisfaction remains statistically significant, it is comparatively weak ($\beta = 0.166$, $p < 0.001$), suggesting a pattern of near-full mediation.

From a theoretical perspective, this mediating structure is well supported by service and quality management literature. EDSC functions primarily as an antecedent that enhances customers' perceptions of service delivery quality, which subsequently serves as the main cognitive basis for forming satisfaction judgments. In this sense, customers evaluate their satisfaction largely through perceived service quality rather than through the direct influence of EDSC alone. This is consistent with classical service theories that position service quality as the immediate determinant of satisfaction, while other operational or organizational factors exert their influence indirectly through quality perceptions.

The near-full mediation result indicates that the effect of EDSC on customer satisfaction is largely transmitted through perceived service quality, underscoring the critical role of quality perceptions as a psychological and evaluative mechanism. Accordingly, improvements in EDSC alone are insufficient unless they are effectively translated into enhanced perceived service quality, which ultimately drives customer satisfaction levels.

Overall, the results support all hypothesized relationships and confirm the robustness of the proposed theoretical model:

H1: The efficiency of digital supply chains has a positive effect on customer satisfaction **(validated).**

H2: The efficiency of digital supply chains has a positive effect on perceived service quality **(validated).**

H3: Perceived service quality has a positive effect on customer satisfaction **(validated).**

4.2.4. Testing the impact of the mediating variable in the study model

The following table shows the indirect path coefficients that examine the indirect impacts between the study variables with the presence of the mediating variable (perceived service quality).

Table 10: Indirect path coefficients for the study hypotheses

	Original sample (O)	Samplemean (M)	STDEV	T statistics	P value
EDSC>CusSat	.0623	.0625	0.044	14.037	0.000

Source: Smartpls4 outputs.

The results show a strong and significant indirect impact of EDSC on Customer Satisfaction (β = 0.623, t = 14.037, p < 0.001). This confirms that EDSC influences customer satisfaction mainly through the mediating mechanism, highlighting the importance of the indirect pathway in explaining the relationship between the two constructs.

We verify the validity of the previous hypothesis using the confidence interval coefficient.

Table 11: Indirect path coefficients for the study hypotheses

	Original sample (O)	Samplemean (M)	%2.5	%97.5
EDSC>PerSerQua>CusSat	.0623	.0625	.0546	.0720

Source: Smartpls4 outputs.

The results in the table above indicate that the mediation of the perceived service quality variable in the study model is achieved, given that the confidence interval values at the lower (2.5%) and upper (97.5%) levels do not intersect at zero.

Building on the direct relationships established in the previous hypotheses, this study further extends the theoretical model by examining the mediating role of perceived quality in the relationship between digital supply chain efficiency and customer satisfaction. From a PLS-SEM perspective, mediation analysis allows for the assessment of whether the effect of an exogenous construct on an endogenous construct is transmitted through a mediating variable, thereby providing a more comprehensive understanding of the underlying structural mechanisms within the model.

In this context, digital supply chain efficiency is expected to enhance perceived quality through improved service reliability, information transparency, and operational responsiveness, which in turn shape customers' cognitive evaluations of service performance. These enhanced perceptions are likely to translate into higher levels of customer satisfaction. This logic is consistent with the structural mediation framework commonly tested in variance-based SEM, where indirect effects are assessed alongside direct effects to determine the nature and strength of mediation (Hair , Black, Babin, & Anderson, 2019; Nitzl, Roldan, & Cepeda, 2016). Accordingly, perceived quality is hypothesized to act as a mediating mechanism through which digital supply chain efficiency influences customer satisfaction. This aligns with prior empirical evidence suggesting that service-related perceptions often serve as key intervening variables in digital and e-service environments, explaining how technological and operational capabilities translate into customer-level outcomes.

H4: Perceived quality mediates the relationship between digital supply chain efficiency and customer satisfaction among Algerian consumers of online stores **(Validated).**

5.Discussion of findings:

5.1. Digital Supply Chain Efficiency and Customer Satisfaction (H1)

The findings revealed that digital supply chain efficiency has a significant positive effect on customer satisfaction among Algerian online consumers. This result indicates that efficient digital supply chain processes contribute to improving customers' overall shopping experience by ensuring timely delivery, accurate order fulfillment, and greater service reliability. As digital technologies enhance coordination and information flow across supply chain activities, customers benefit from more responsive and dependable services, leading to higher satisfaction levels.

This finding is consistent with the study of Al-Jadida and Mahmoud (2022), which demonstrated that electronic supply chain management positively influences customer satisfaction. It also supports the findings of Choi (2020), who reported that improvements in logistics responsiveness and reliability significantly enhance customer satisfaction in e-commerce environments. Furthermore, the result aligns with the arguments of Ivanov (2021), who emphasized that digital supply chain systems improve customer experience through better visibility and disruption management.

In the Algerian context, this result suggests that online retailers can strengthen customer satisfaction by investing in digital supply chain capabilities that improve delivery performance, transparency, and operational efficiency.

5.2. Digital Supply Chain Efficiency and Perceived Service Quality (H2)

The results confirmed that digital supply chain efficiency positively affects perceived service quality. This finding suggests that customers evaluate service quality not only through direct interactions with online platforms but also through the effectiveness of underlying supply chain processes. Efficient digital supply chains contribute to faster response times, improved order accuracy, and greater reliability, all of which enhance customers' perceptions of service quality.

This result is consistent with the conceptual work of Ivanov et al. (2020), who argued that digital technologies improve transparency, responsiveness, and operational efficiency throughout supply chains. It also supports the findings of Sharma (2022), who highlighted the role of artificial intelligence in enhancing logistics performance and service responsiveness. Similarly, Wamba (2021) found that data-driven capabilities improve operational decision-making and service outcomes.

The finding indicates that the quality perceived by customers is strongly influenced by the effectiveness of digital supply chain operations, emphasizing the strategic importance of digital transformation initiatives in e-commerce environments.

5.3. Perceived Service Quality and Customer Satisfaction (H3)

The findings demonstrated that perceived service quality has a significant positive effect on customer satisfaction. This result confirms that customers who perceive higher levels of service quality tend to report greater satisfaction with online shopping experiences. Dimensions such as reliability, responsiveness, assurance, and efficiency play a crucial role in shaping customer evaluations of digital services.

This finding is strongly supported by the service quality literature. It is consistent with Parasuraman, Zeithaml, and Malhotra (2005), who developed the E-S-QUAL model and identified service quality as a major determinant of customer satisfaction in electronic environments. The result also agrees with Carlson (2011), Rita et al. (2019), and Kumar (2022), all of whom found that perceived service quality significantly influences customer satisfaction and behavioral intentions.

These findings reinforce the argument that service quality remains a central factor in achieving customer satisfaction, even in highly digitalized business environments.

5.4. The Mediating Role of Perceived Service Quality (H4)

The mediation analysis revealed that perceived service quality significantly mediates the relationship between digital supply chain efficiency and customer satisfaction. This result indicates that the positive impact of digital supply chain efficiency on customer satisfaction is partially transmitted through customers' perceptions of service quality. In other words, improvements in supply chain efficiency enhance customer satisfaction because they first improve the quality of service perceived by customers.

This finding is consistent with Roh (2021), who argued that digital supply chain capabilities create customer value through intermediate mechanisms. It also supports the findings of Wamba (2021), Sharma (2022), Li (2023), and Wang (2024), which demonstrated that the effects of digitalization on performance outcomes frequently operate through mediating variables such as responsiveness, visibility, resilience, and value creation.

The current study extends previous research by identifying perceived service quality as a key mediating mechanism linking digital supply chain efficiency to customer satisfaction within the Algerian e-commerce context. While previous studies focused primarily on operational and organizational mediators, the present study highlights the importance of customers' service evaluations in translating supply chain capabilities into favorable customer outcomes.

Overall, the findings suggest that digital supply chain investments alone may not directly guarantee higher customer satisfaction unless they contribute to improving the quality of services perceived by customers.

6. Conclusion and implications

This study investigated the impact of digital supply chain efficiency on customer satisfaction, with perceived service quality examined as a mediating variable, within the context of well-known online platforms such as Shein, Temu, Jumia, and similar e-commerce environments. The findings provide empirical evidence supporting all proposed hypotheses and highlight the structural relationships among the studied constructs.

The results indicate that digital supply chain efficiency has a significant positive effect on customer satisfaction among Algerian online consumers.In addition, digital supply chain efficiency demonstrates a significant positive influence on perceived service quality, suggesting that enhanced digital integration, operational responsiveness, and information flow contribute to more favorable customer evaluations of service performance. Furthermore, perceived service quality was found to have a significant positive effect on customer satisfaction, reinforcing its central role in shaping consumer judgments in online retail contexts. Importantly, the analysis also confirms a significant indirect effect of digital supply chain efficiency on customer satisfaction through perceived service quality, thereby supporting the mediating mechanism proposed in the conceptual model.

From a managerial perspective, these findings underscore the strategic importance of digital transformation in supply chain management. Investments in advanced technologies such as artificial intelligence, the Internet of Things, and blockchain are likely to enhance transparency, traceability, and operational efficiency across supply chain processes, which in turn strengthens customer-perceived service quality. Moreover, the results highlight the necessity for online retailers to systematically monitor and improve perceived service quality as a key determinant of customer satisfaction.

Finally, the study suggests that customer satisfaction should be integrated as a core performance indicator within digital supply chain strategies, enabling organizations to continuously evaluate and improve their service delivery systems in highly competitive e-commerce environments.

7. List of references

Carlson, A. (2011). Managing web site performance: Antecedents to successful e-service quality. *Journal of Services Marketing*, 458–473. Retrieved from https://doi.org/10.1108/08876041111173611

Rita, , P., Oliveira, T., & Farisa, A. (2019). The impact of e-service quality and customer satisfaction on customer behavior in online shopping. *Heliyon, 10*(5). Retrieved from https://doi.org/10.1016/j.heliyon.2019.e02690

Abusalma, A., Al- Daoud, K., Suleiman , I., & Vasudevan, A. (2024). Elevating Customer Satisfaction: The Crucial Role of Electronic Service Quality in Today's Digital Landscape. *International Review of Management and Marketing, 14*(6), 372-377. Retrieved from https://econjournals.com/index.php/irmm/article/view/17601/8385

Ayotunde, O., Omoyele , O., & Olabode , O. (2022). From service quality to e-service quality: measurement, dimensions and model. *Journal of Management Information and Decision Sciences, 25*(1), 1-15. Récupéré sur https://www.abacademies.org/articles/from-service-quality-to-eservice-quality-measurement-dimensions-and-model-13796.html

choi, T. (2020). Innovative "bring-service-near-your-home" operations under Coronavirus (COVID-19/SARS-CoV-2) outbreak: Can logistics become the Messiah? *Transportation Research Part E: Logistics and Transportation Review*. Retrieved from https://doi.org/10.1016/j.tre.2020.101961

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2rd ed.). New york: NJ: Lawrence Erlbaum Associates.

Coursera Staff. (2025, 08 12). *Digital Supply Chains: Definition, Benefits, and Careers*. Retrieved from https://www.coursera.org/: https://www.coursera.org/articles/digital-supply-chain

Cronin, J., & Taylor, S. (1992). Measuring Service Quality: A Reexamination and Extension. *Journal of Marketing, 56*, 55-68.

Hair , J., Black, W., Babin, B., & Anderson, R. (2019). *Multivariate Data Analysis* (8th ed.). United Kingdom: Cengage Learning EMEA.

Henseler, J., Ringle, C., & Sarstedt, M. (2015). Anewcriterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115-135. doi:10.1007/s11747-014-0403-8

ivanov, D. (2021). Digital supply chain management and technology to enhance resilience by building and using end-to-end visibility during the COVID-19 pandemic. *IEEE Transactions on Engineering Management, 69*(05), 2793–2807. Retrieved from https://doi.org/10.1109/TEM.2021.3095193

ivanov, D., queiroz, M., dolgui, A., & wamba, S. (2020). Impacts of epidemic outbreaks on supply chains: Mapping a research agenda amid the COVID-19 pandemic through a structured literature review. *Annals of Operations Research, 319*(1-2), 1155–1196. Retrieved from https://doi.org/10.1007/s10479-020-03685-7

Kim, S., & Yang, Y. (2025). The Effect of Digital Quality on Customer Satisfaction and Brand Loyalty Under Environmental Uncertainty: Evidence from the Banking Industry. *Sustainability, 17*(8), 1-44.

kumar. (2022). System and service quality influence on customer satisfaction and behavioral intention in quick commerce applications. *Academy of Marketing Studies Journal, 26*(3-4), 209-224. Retrieved from https://doi.org/10.35631/JISTM.1039014

Kwong, K., & Wong, K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin, 24*(1), 1-32.

li, a. (2023). Impact of supply chain digitalization on supply chain resilience and performance: A multi-mediation model. *International Journal of Production Economics, 259*. Retrieved from https://doi.org/10.1016/j.ijpe.2023.108817

Nitzl, C., Roldan, J., & Cepeda, G. (2016). Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. *Industrial Management & Data Systems, 116*(9), 1849–1864. doi:https://doi.org/10.1108/IMDS-07-2015-0302

Oakland, J. S. (2014). *Total Quality Management and Operational Excellence: Text with cases* (Fourth ed.). London & New York: Routledge, Taylor and Francis Group.

Obadă, D.-R. (2014). Measuring Perceived Service Quality Offline vs. Online: A New PeSQ Conceptual Model. *Procedia Economics and Finance, 15*, 538 – 551. doi:10.1016/S2212-5671(14)00505-X

parasuraman, A., zeithaml, V., & malhotra, A. (2005). E-S-QUAL: A multiple-item scale for assessing electronic service quality. *Journal of Service Research, 7*(3), 213–233. Retrieved from https://doi.org/10.1177/1094670504271156

Parasurman, A., Zeithaml, V., & Berry, L. (1988). SERVQUAL: A multiple item scale for measuring consumer perceptions of service quality. *Springer, 64*(12-40).

Ramasamy et al. (2024). Conceptual review of consumer satisfaction theories with expectation-confirmation and disconfirmation paradigm for business sustainable growth and decision making. *F1000Research, 13*, 1-16. doi:10.12688/f1000research.158612.1

Roh , e. (2021). Digital transformation of supply chains and customer value creation. *Journal of Business Research, 130*, 1-12. Retrieved from https://doi.org/10.1016/j.jbusres.2021.01.021

sharma. (2022). artificial intelligence in logistics and supply chain management. (t. a. francis, Ed.) *international journal of production research, 60*, 1-20. Retrieved from https://doi.org/10.1080/00207543.2022.2034371

Spreng, R., & Mackoy, R. (1996). An empirical examination of a model of perceived service quality and satisfaction. *Journal of Retailing, 72*(2), 201-214.

Stange, R., Scheffler, P., & Henseler, J. (2025). A systematic review of theoretical, methodological, contextual, and content-related foundations of customer delight research. *Total Quality Management, 36*(6), 503-526. doi:0.1080/14783363.2025.2469294

wamba, e. (2021). Big data analytics and supply chain performance. *International Journal of Production Economics, 231*, 108-120. Retrieved from https://doi.org/10.1016/j.ijpe.2020.107928

wang, a. (2024). Supply chain digitalization and performance: A moderated mediation of supply chain visibility and supply chain survivability. *Heliyon, 10*(4). Retrieved from https://doi.org/10.1016/j.heliyon.2024.e25584

Yum, K., & Kim, J. (2024). The Influence of Perceived Value, Customer Satisfaction, and Trust on Loyalty in Entertainment Platforms. *Applied Sciences, 14*(3), 1-17. doi:10.3390/app14135763

Zeithaml, V., Parasuraman, A., & Malhotra, A. (2002). Service quality delivery through web sites: A critical review of extant knowledge. *Journal of the Academy of Marketing science, 30*(4), 362-375. Retrieved from https://www.researchgate.net/publication/225427196_Service_Quality_Delivery_Through_Web_Sites_A_Critical_Review_of_Extant_Knowledge

Zhang, G., MacCarthy, B., & Ivanov, D. (2022). The cloud, platforms, and digital twins—Enablers of the digital supply chain. In *The Digital Supply Chain* (pp. 77-91). Elsevier.

APPENDIX

QUESTIONNAIR

N°	Expression	SCALE				
		Stronglydesagree	Desagree	Neutral	Agree	StronglyAgree
		1	2	3	4	5
Digital SupplyChain Efficiency						
1	I can track my order easily and in real time					

2	Delivery time wasfast					
3	Orders arrive accurately without errors or deficiencies					
4	I had flexibility to modify or cancel my order before shipping					
5	Customer service was quick and efficient in resolving my issue					
6	Provides clear and easily accessible shipping and delivery information					
7	The store uses advanced technologies to store and process orders					
8	The store's digital system helps provide a seamless shopping experience					
The perceived quality of service provided to the customer						
10	**Tangibility** The store website or platform design is clear and easy to use					
11	Products are presented in an organized manner that makes it easy to compare them					
12	The pictures and specifications in the store are accurate and reflect the real product					
13	**Reliability** The store adheres to order delivery deadlines					
14	Products received often match what is displayed on the website					
15	When a problem occurs with the order, it is taken seriously					
16	**Responsiveness** Customer service is quick to respond to inquiries					
17	The return or exchange process is easy and clear					
18	The store provides immediate and impactive solutions when problems occur					
19	**Guarrantee** I feel safe paying through this store					
20	Customer service staff have enough knowledge to answer questions					
21	The store's policies ensure consumer protection					
22	**Empathy** The store you deal with cares about the comfort and satisfaction of its customers.					
23	The site offers personalized suggestions that suit my interests					
24	I feel that the site used for the purchase process understands my needs as a consumer					
25	The quality of the products offered is good and matches my expectations					
Customer satisfaction						
19	I am generally satisfied with the shipping services from this store					
20	I feel confident when dealing with e-store when purchasing.					
21	I am willing to buy from e-stores again					
22	After-sales services were satisfactory					
23	Product shipping costs are acceptable to me					
24	Prices are good in online stores					