THE IMPACT OF E-COMMERCE LOGISTICS SERVICE QUALITY OF FRESH CUT FLOWERS ON CUSTOMER SATISFACTION IN YUNNAN PROVINCE

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ABSTRACT

Yunnan Province, the largest producer of fresh-cut flowers in China, faces serious logistical challenges in its e-commerce development due to mountainous terrain, long-distance transportation, and insufficient cold chain infrastructure. Given the highly perishable nature of fresh flowers, logistics service quality (LSQ) plays a decisive role in shaping customer satisfaction. This study set out: (1) To examine how each logistics service quality dimension affects customer satisfaction; (2) To provide practical strategies for enhancing customer satisfaction.

A quantitative research method was employed, and data were collected from 508 valid questionnaires. The analysis results indicate that all five dimensions of logistics service quality exert a significant positive influence on customer satisfaction, with assurance, empathy, and tangibles demonstrating the strongest effects.

Based on the key findings, the study proposes the following improvement strategies: enhancing assurance by providing professional training for logistics and customer service personnel, strengthening empathy through personalized services and emotional care, and improving tangibles by investing in better packaging materials and design to ensure product protection and freshness. In addition, it is essential to ensure timely and accurate deliveries, expand the coverage of cold chain infrastructure, and implement transparent logistics tracking systems. These measures can help reduce product loss, improve operational efficiency, increase customer loyalty, and promote the sustainable development of Yunnan's fresh flower e-commerce industry.

Keywords: fresh-cut flowers e-commerce, logistics service quality, customer satisfaction, SERVQUAL.

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DUAN MENGLU

DECLARATION

I, Duan Menglu, hereby declare that this Independent Study entitled “The Impact of E-commerce Logistics Service Quality of Fresh Cut Flowers on Customer Satisfaction in Yunnan Province” is an original work and has never been submitted to any academic institution for a degree.

(Duan Menglu)

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Chapter 1 Introduction

1.1 Background of the Study

In recent years, with the rapid development of Internet technology and the continuous improvement of residents' economic levels, e-commerce has experienced explosive growth, propelling many industries into the digital era. This transformation has facilitated deep integration between traditional industries and the Internet, reshaping both consumer behavior and business models. As a product that enhances quality of life and conveys emotional value, fresh-cut flowers have gradually become an important commodity for consumers seeking spiritual satisfaction. With rising living standards, consumer demand for higher quality, freshness, and diversity of fresh-cut flowers has been increasing. However, China's traditional distribution model for fresh cut flowers relies heavily on offline multi-tier supply chains (such as "grower → wholesaler → retailer → consumer"), which are characterized by long transportation cycles and multiple intermediaries. This inefficiency often results in high product loss rates and fails to meet modern consumers' expectations for convenience and reliability.

The rise of e-commerce platforms and advancements in cold-chain logistics technologies have provided potential solutions to this problem. Fresh cut flower e-commerce, with its convenient purchasing channels and diversified product choices, has quickly gained consumer popularity. According to industry reports, the transaction volume of China's fresh agricultural product e-commerce reached 26 billion RMB in 2014, marking this field as the "last blue ocean" of the e-commerce sector (iResearch, 2015). As a perishable subcategory of fresh agricultural products, fresh-cut flowers are highly vulnerable to damage and decay, thus placing strict requirements on logistics services such as temperature control, packaging integrity, and delivery timeliness. Despite significant technological progress, logistics service quality remains a critical bottleneck. For instance, during peak seasons such as Valentine's Day, delivery delays and improper handling frequently result in consumer complaints about wilted flowers or late arrivals, directly reducing customer satisfaction and repurchase intentions (Kunming Flower Association, 2023).

Yunnan Province, as China's primary production area for fresh cut flowers, is renowned for its unique climatic conditions, including abundant sunlight, minimal

annual temperature variation, and significant diurnal temperature differences. It has become the largest fresh-cut flower production base in China, accounting for more than 70% of national output and maintaining the leading position for 29 consecutive years (Yunnan Provincial Department of Agriculture, 2022). The Kunming International Flower Auction Trading Center (KIFA), as the largest flower auction market in Asia and the second largest worldwide, records an annual transaction volume exceeding 1.5 billion stems (Sun, 2015).

Nevertheless, this massive industry faces severe logistics challenges in the expansion of e-commerce channels. Fresh cut flowers are highly perishable and extremely time-sensitive, while Yunnan's complex mountainous geography, long transport distances, and insufficient cold-chain coverage together create significant bottlenecks in e-commerce logistics services. These issues lead to high circulation losses and undermine efficiency. Against this background, logistics service quality has emerged as the core factor determining the success or failure of Yunnan's fresh-cut flower e-commerce, with its importance becoming particularly prominent. For products like fresh cut flowers, which are both highly perishable and time-sensitive, the quality of logistics services directly determines the final product condition and consumers' actual experience, thereby representing the most direct and critical factor influencing customer satisfaction. Efficient logistics services can not only minimize transportation losses and preserve freshness, but also meet consumer expectations for fast, accurate, and reliable delivery. Therefore, investigating the specific impact mechanisms of various dimensions of logistics service quality on customer satisfaction in the context of Yunnan's fresh-cut flower e-commerce is of crucial theoretical and practical significance. Accurately identifying and optimizing logistics service quality as the key industry pain point can enhance consumer satisfaction, reduce losses, improve operational efficiency, strengthen e-commerce competitiveness, and ultimately promote the sustainable development and upgrading of Yunnan's fresh-cut flower industry.

1.2 Problems of the Study

Building upon the background outlined above, it is evident that logistics service quality plays a decisive role in determining the success of e-commerce in the fresh-cut flower industry. The perishable nature of fresh-cut flowers and their reliance on timely, reliable, and efficient delivery systems highlight the necessity of examining logistics service performance from the consumer's perspective. While prior studies have investigated logistics service quality in broader e-commerce or fresh agricultural products, limited research has specifically addressed the unique characteristics of

fresh-cut flowers in the Yunnan context. Considering Yunnan's dominant role in China's fresh cut flower production and the growing reliance on e-commerce platforms for distribution, a focused investigation is required to understand how different dimensions of logistics service quality affect customer satisfaction. The specific research questions are:

1. Do the various dimensions of logistics service quality have a significant impact on customer satisfaction?
2. What targeted strategies can be proposed to enhance customer satisfaction?

1.3 Objectives of the Study

This study focuses on the e-commerce logistics system of cut flowers in Yunnan, highlighting the region's geographical constraints, such as mountainous terrain and long transportation distances, as well as the inherent characteristics of cut flowers, including high time sensitivity and perishability. By analyzing the current state and key challenges of logistics services, and taking customer satisfaction as the foundation of the research, the study aims to propose feasible development strategies to optimize logistics, improve efficiency, enhance industry benefits, and promote the development of the regional e-commerce logistics sector for cut flowers. The specific research objectives are as follows:

1. To examine how each logistics service quality dimension affects customer satisfaction.
2. To provide practical strategies for enhancing customer satisfaction.

1.4 Scope of the Study

This study focused on the impact of logistics service quality on customer satisfaction in the context of Yunnan Province's cut flower e-commerce. The scope of the research was defined across multiple dimensions to comprehensively and systematically understand the current state of logistics services and their influence on customer experience.

On one hand, the study was based on the widely adopted SERVQUAL model, which categorizes logistics service quality into five core dimensions: Reliability—the ability of the logistics service to consistently and accurately fulfill its promises; Responsiveness—the willingness of the logistics provider to actively assist customers and provide prompt service; Assurance — the professionalism, courtesy, and

trustworthiness conveyed by staff; Empathy — the degree of care and personalized attention given to customers; and Tangibles—the physical aspects of the service such as facilities, delivery equipment, and personnel appearance. This multidimensional evaluation framework enables a more precise assessment of e-commerce logistics service quality, which is particularly important for cut flowers — a product category highly sensitive to time and preservation conditions.

On the other hand, the study included a diverse range of demographic characteristics among e-commerce consumers, including gender, age, educational background, and income level, to reflect variations in service needs and satisfaction levels across different customer groups. By distributing structured questionnaires, the study collected not only overall customer satisfaction data but also detailed insights into consumer perceptions and evaluations of the five logistics service dimensions mentioned above. This analysis helped uncover customer preferences and behavioral trends across different segments.

By combining the analysis of service quality with demographic profiling of consumers, the study aimed to provide a comprehensive picture of the current state, challenges, and development potential of the logistics services in Yunnan's cut flower e-commerce sector. The research findings offer both theoretical insights and practical guidance for optimizing logistics services, improving customer satisfaction, reducing transportation losses, and strengthening platform competitiveness, ultimately supporting the high-quality and sustainable development of the regional cut flower e-commerce logistics system.

1.5 Significance of the Study

1) Theoretical Significance:

Current research on e-commerce logistics service quality and customer satisfaction is largely focused on general merchandise or fresh agricultural products, while targeted studies on highly time-sensitive and high-loss categories like cut flowers remain limited. This study focuses on the cut flower industry in Yunnan Province, China, and adapts the classical SERVQUAL model to the e-commerce logistics context of highly perishable goods. By analyzing the unique characteristics of logistics services in this sector, the study aims to fill an existing research gap, enrich the theoretical framework of agricultural e-commerce logistics, and provide a more specialized perspective for logistics research involving similar perishable product categories.

2) Practical Significance:

The findings of this study can offer concrete and actionable recommendations for e-commerce platforms and logistics enterprises involved in Yunnan's cut flower industry. By accurately identifying key weaknesses in the logistics system—such as inadequate packaging, inefficient route planning, and insufficient cold chain coverage—businesses can implement targeted strategies to reduce losses, improve efficiency, and enhance customer satisfaction. High-quality logistics services not only help expand the online sales scale of cut flowers and reduce circulation losses but also enable flower growers to connect more effectively with markets nationwide, thereby improving the overall performance of the supply chain.

1.6 Definition of Key Terms

1) Logistics Service Quality (LSQ):

Logistics service quality refers to the overall effectiveness and efficiency of logistics services as perceived by customers. It encompasses both operational outcomes, such as timeliness and accuracy, and customer perceptions of service performance. In this study, LSQ is measured based on the SERVQUAL model, including five dimensions: Reliability, Responsiveness, Assurance, Empathy, and Tangibles.

2) Reliability:

Reliability denotes the ability of logistics service providers to deliver products accurately, consistently, and on time as promised. It involves order accuracy, delivery consistency, and maintaining product freshness and integrity, particularly for perishable goods such as fresh-cut flowers.

3) Responsiveness:

Responsiveness refers to the willingness and ability of service providers to respond promptly to customer needs, handle complaints, and resolve problems efficiently. In e-commerce logistics, responsiveness also includes timely updates of logistics information and quick processing of after-sales issues.

4) Assurance:

Assurance highlights the professionalism, competence, courtesy, and trustworthiness of logistics staff, which builds customer confidence in the logistics process. It also covers aspects such as confidentiality of customer information, transparency of service policies, and reliable delivery commitments.

5) Empathy:

Empathy reflects the extent to which logistics service providers demonstrate care, understanding, and individualized attention to customers. It includes proactive communication, flexible delivery arrangements, and personalized services that make customers feel valued and understood.

6) Tangibles:

Tangibles refer to the physical and visible elements of logistics services, such as facilities, delivery vehicles, equipment, packaging, and the appearance of logistics personnel. For fresh cut flowers, tangibles also include cold chain packaging, storage facilities, and the cleanliness of delivery processes, which serve as important cues of service quality.

7) Customer Satisfaction:

Customer satisfaction is defined as the overall evaluation of logistics services based on the extent to which customer expectations are met or exceeded. It reflects consumers' cognitive and emotional responses after comparing expected service quality with actual delivery experiences. In this study, customer satisfaction specifically refers to customers' satisfaction with the logistics service quality of fresh-cut flower e-commerce platforms.

8) Fresh Cut Flowers E-commerce:

Fresh cut flowers e-commerce refers to the online trading of fresh cut flowers, such as roses, lilies, carnations, and similar floral products, supplied from producers and delivered to consumers through digital platforms. Given the perishability and time sensitivity of such products, logistics service quality plays a decisive role in shaping customer experience and satisfaction in this sector.

Chapter 2 Literature Review

2.1 Introduction

A comprehensive review of the relevant literature is essential to establish the theoretical foundation for this study. Since logistics service quality is at the core of this research, this chapter begins by discussing its conceptual development and significance in both traditional and e-commerce contexts. Next, attention is given to existing models for evaluating logistics service quality, particularly the SERVQUAL model and the Logistics Service Quality, (LSQ) model, followed by an explanation of why SERVQUAL is adopted as the primary theoretical framework of this study.

Subsequently, the five dimensions of logistics service quality — Reliability, Responsiveness, Assurance, Empathy, and Tangibles—are examined in detail, as they serve as the basis for the hypotheses of this research. The chapter then turns to the concept of customer satisfaction, reviewing its definition, importance, and established relationship with service quality. In addition, literature related to e-commerce and perishable products is reviewed, with particular attention to the unique characteristics of fresh-cut flowers and the emerging field of fresh-cut flower e-commerce.

Finally, the chapter concludes by identifying the existing research gaps and highlighting the need to investigate the impact of logistics service quality on customer satisfaction in the context of Yunnan's fresh-cut flower e-commerce sector. This provides the foundation for the research design and methodology presented in the next chapter.

2.2 Literature Review

2.2.1 Logistics Service Quality

Logistics service quality (LSQ) has been widely recognized as a key determinant of customer satisfaction and firm competitiveness. However, scholars have approached the definition of LSQ from different perspectives. Mentzer et al. (1989) initially described logistics service quality as the ability of logistics providers to consistently meet customer requirements, emphasizing timeliness, accuracy, and reliability. Bienstock et al. (1997) extended this view by proposing that LSQ should be conceptualized as a multidimensional construct encompassing both operational performance and customer perceptions of service delivery.

Building on service quality literature, Parasuraman et al. (1988) introduced the SERVQUAL model, which highlighted five universal dimensions—Reliability,

Responsiveness, Assurance, Empathy, and Tangibles—that are applicable to logistics contexts as well. Similarly, Mentzer et al. (2001) developed a logistics-specific service quality model (LSQ model), emphasizing elements such as order accuracy, delivery condition, and information quality as crucial indicators of logistics performance.

Other scholars have stressed the importance of contextualizing LSQ within e-commerce. For example, Rahman (2006) argued that in the online shopping environment, LSQ extends beyond traditional transportation to include order tracking, real-time information, and complaint handling. Liu et al. (2018) further pointed out that for perishable goods, LSQ must focus not only on efficiency but also on maintaining product quality during distribution.

In sum, while definitions vary, most scholars agree that LSQ is a multidimensional construct integrating both operational outcomes and customer perceptions. Particularly in e-commerce contexts, and even more so for perishable and time-sensitive products such as fresh-cut flowers, LSQ plays a decisive role in shaping customer experience and satisfaction.

2.2.2 Models of Logistics Service Quality

(1) SERVQUAL Model

The SERVQUAL model, developed by Parasuraman et al. (1988), is one of the most widely used frameworks for assessing service quality. It evaluates service quality from the perspective of consumer perceptions and expectations, and identifies five key dimensions: Reliability, Responsiveness, Assurance, Empathy, and Tangibles. This model emphasizes the gap between customer expectations and their perceptions of actual service performance, making it highly effective in capturing how customers evaluate services.

SERVQUAL has been extensively applied across a wide range of industries, including banking, healthcare, retail, and logistics (Cronin & Taylor, 1992; Dabholkar et al.,2000). Its strengths lie in its structured measurement approach, clear dimensional framework, and strong applicability across diverse service contexts. In logistics research, SERVQUAL has been particularly useful for understanding customer satisfaction, as it links service quality directly to consumer perceptions and behavioral outcomes.

(2) LSQ Model

In contrast, Mentzer et al. (2001) developed the Logistics Service Quality (LSQ) model, which specifically addresses the logistics industry. Unlike SERVQUAL, which is more general, the LSQ model focuses on logistics-specific service attributes, including order accuracy, timeliness of delivery, information quality, flexibility, and

condition of goods upon delivery. This framework highlights the operational aspects of logistics services that directly affect supply chain performance.

The LSQ model has been applied in contexts such as transportation, shipping, and supply chain management (Bienstock et al., 1997; Thai, 2013). Its advantage lies in capturing the detailed operational performance of logistics service providers, making it highly relevant for logistics practitioners. However, its limitation is that it places less emphasis on customer perceptions and expectations, which are critical when analyzing customer satisfaction.

(3) Comparison and Justification

Both SERVQUAL and LSQ provide valuable insights into logistics service quality. SERVQUAL is widely recognized for its customer-oriented approach and applicability across industries, while LSQ is more specialized and operationally focused on logistics performance. For the purposes of this study, SERVQUAL is adopted as the theoretical foundation because it emphasizes consumer perceptions and provides a robust framework for analyzing the impact of logistics service quality on customer satisfaction in the e-commerce context of fresh cut flowers.

2.2.3 Dimensions of Logistics Service Quality

The SERVQUAL model proposed by Parasuraman et al. (1988) has been widely adopted for evaluating service quality, including logistics service quality. It identifies five key dimensions—Reliability, Responsiveness, Assurance, Empathy, and Tangibles—which have been validated across different industries and contexts. In logistics and e-commerce studies, these dimensions serve as important predictors of customer satisfaction.

(1) Reliability

Reliability refers to the ability of logistics providers to consistently deliver goods accurately, on time, and in good condition. Parasuraman et al. (1988) emphasized reliability as the cornerstone of service quality, while Zeithaml et al. (1996) found that reliability is the most important factor influencing customers' perceptions of overall service. In logistics, Lai et al. (2009) demonstrated that reliable delivery performance builds customer trust, which directly enhances satisfaction. Rao et al. (2011) specifically noted that for perishable products, reliability in maintaining freshness and preventing damage is crucial for repeat purchases.

Furthermore, Bienstock et al. (1997) observed that reliability reduces uncertainty in logistics operations, thereby reinforcing customer confidence in e-commerce transactions. Liu et al. (2018) also confirmed that consistent and accurate delivery

significantly increases satisfaction among fresh product consumers. Overall, reliability has been consistently identified as one of the strongest predictors of customer satisfaction in logistics services.

(2) Responsiveness

Responsiveness captures the willingness and ability of logistics providers to address customer inquiries, provide timely information, and resolve problems quickly. Cronin and Taylor (1992) argued that responsiveness shapes service performance and has a direct effect on satisfaction. In the logistics sector, Rahman (2006) found that responsiveness in handling service failures, such as late deliveries or damaged goods, plays a critical role in customer retention.

Shang and Lu (2012) highlighted the importance of responsiveness in e-commerce logistics, where real-time communication and prompt complaint handling significantly influence customer satisfaction. Chen et al. (2015) further emphasized that responsiveness increases perceived service value, leading to higher loyalty intentions. In the context of perishable product delivery, high responsiveness mitigates dissatisfaction arising from delays or product deterioration, thereby sustaining positive customer experiences.

(3) Assurance

Assurance reflects the competence, credibility, and courtesy of logistics staff, which foster customer confidence in the service process. Grönroos (1984) highlighted that credibility and professionalism are critical in building trust-based relationships with customers. Bienstock et al. (1997) similarly found that assurance through staff knowledge and transparent service procedures improves customers' sense of security.

In online shopping, Flavián et al. (2006) demonstrated that assurance extends to perceived security of transactions and reliability of delivery services, which directly influence satisfaction and repurchase intentions. For perishable products, Sun (2015) observed that assurance provided by logistics staff, such as careful handling of goods and professional communication, reduces consumer concerns about product quality and reliability. Assurance, therefore, plays a dual role in both functional service delivery and the psychological comfort of customers, both of which enhance satisfaction.

(4) Empathy

Empathy refers to the extent to which logistics providers deliver individualized attention and demonstrate understanding of customer needs. Parasuraman et al. (1988) emphasized that empathy enhances customers' perceptions of fairness and personalized service. In logistics, Mentzer et al. (2001) noted that empathy can be

shown through flexible delivery options, personalized communication, and willingness to accommodate special requests.

Rahman (2006) found that empathy contributes to higher satisfaction by reducing the perceived gap between customer expectations and actual experiences. Liu et al. (2018) highlighted that empathy is particularly important in perishable product delivery, as customers value proactive updates and reassurance about product condition. Empathy also strengthens emotional bonds with customers, which in turn improves loyalty (Anderson & Srinivasan, 2003). In fresh cut flower e-commerce, empathy—through personalized reminders, flexible delivery times, and considerate packaging—has been shown to significantly enhance customer satisfaction.

(5) Tangibles

Tangibles encompass the physical and visible elements of logistics services, such as delivery vehicles, storage facilities, packaging, and staff appearance. Bitner (1992) argued that tangibles serve as important quality cues, especially when customers cannot evaluate intangible aspects of service prior to consumption. Chow et al. (2007) confirmed that tangible attributes such as packaging quality, tracking systems, and physical infrastructure strongly affect customer perceptions in logistics.

In perishable product e-commerce, tangibles are critical because they directly influence product freshness and presentation. Sun (2015) found that inadequate packaging and insufficient cold chain infrastructure were leading causes of customer dissatisfaction in flower logistics. Conversely, attractive and protective packaging not only preserves freshness but also creates a positive unboxing experience, which enhances satisfaction and encourages repeat purchases (Kunming Flower Association, 2023).

Taken together, the five SERVQUAL dimensions—Reliability, Responsiveness, Assurance, Empathy, and Tangibles—offer a comprehensive framework for evaluating logistics service quality. Prior research consistently demonstrates that higher performance in these dimensions contributes to improved customer satisfaction, stronger trust, and greater loyalty (Oliver, 1997; Anderson & Srinivasan, 2003). In the context of fresh cut flower e-commerce, these dimensions are particularly critical due to the perishability and time sensitivity of the products, making logistics service quality a decisive factor in shaping customer experience and purchase behavior.

2.2.4 Customer Satisfaction

Customer satisfaction has been extensively studied in marketing, consumer behavior, and service management, and is regarded as a central outcome variable in

service quality research. Scholars have proposed various definitions of customer satisfaction, reflecting both cognitive and affective perspectives. Oliver (1980) defined customer satisfaction as a psychological state resulting from the comparison between pre-purchase expectations and post-purchase performance. Similarly, Kotler (2000) described it as the customer's overall evaluation of a product or service after consumption, emphasizing the role of perceived value.

Churchill and Surprenant (1982) argued that customer satisfaction arises from a process of disconfirmation, where consumers compare their expectations with actual performance; positive disconfirmation leads to satisfaction, while negative disconfirmation leads to dissatisfaction. Later, Anderson and Srinivasan (2003) highlighted the importance of satisfaction in the e-commerce environment, noting that satisfied customers are more likely to exhibit loyalty, repurchase intentions, and positive word-of-mouth.

In the logistics context, satisfaction is closely related to delivery speed, accuracy, packaging integrity, and service responsiveness. Bienstock et al. (1997) pointed out that reliable and efficient logistics services significantly enhance customer satisfaction by reducing uncertainty in product delivery. Liu et al. (2018) found that in the distribution of perishable products, such as fresh food and flowers, customer satisfaction is strongly influenced by product condition upon arrival, timeliness of delivery, and the ability of logistics providers to address service failures.

Moreover, customer satisfaction is often conceptualized as a mediating variable that links service quality to consumer behavioral outcomes. Zeithaml et al. (1996) suggested that high service quality improves satisfaction, which in turn fosters loyalty and repurchase intentions. In e-commerce, Xing and Grant (2006) confirmed that logistics service quality directly impacts satisfaction, which subsequently affects customer retention. For fresh cut flowers in particular, where products are highly perishable and time-sensitive, even minor service failures can severely diminish satisfaction and reduce consumers' willingness to repurchase.

In summary, customer satisfaction is a multidimensional construct influenced by both cognitive evaluations (e.g., reliability, accuracy, timeliness) and affective experiences (e.g., trust, assurance, empathy). As a key mediator between logistics service quality and customer behavior, it plays a crucial role in shaping long-term consumer relationships and enhancing the competitiveness of e-commerce enterprises.

2.2.5 E-commerce Logistics for Fresh Cut Flowers

The rapid development of e-commerce has transformed consumer purchasing behavior by providing convenience, product diversity, and broader market access

(Laudon & Traver, 2020). While these advantages apply to many industries, the distribution of perishable goods through e-commerce presents unique logistical challenges due to the fragile nature and short shelf life of such products. Fresh cut flowers, in particular, are highly perishable and time-sensitive, making logistics service quality (LSQ) a decisive factor in shaping customer experiences.

Kotler and Keller (2012) emphasized that the perishability of agricultural products increases supply chain complexity, as maintaining freshness requires strict time and environmental controls. Hobbs and Young (2000) similarly argued that failure to preserve product quality not only leads to losses but also erodes consumer trust. To address these issues, cold chain logistics—covering temperature-controlled storage, transportation, and packaging—has become essential. Zhao et al. (2019) pointed out that cold chain systems play a critical role in e-commerce distribution of perishable goods, though limited infrastructure in certain regions continues to hinder service quality.

Empirical studies highlight the importance of LSQ in e-commerce for perishable products. Xing and Grant (2006) demonstrated that delivery timeliness and order accuracy significantly influence customer satisfaction in fresh food e-commerce. Liu et al. (2018) further confirmed that packaging integrity and product condition upon arrival strongly shape consumer perceptions of logistics performance. For fresh cut flowers, Sun (2015) stressed that transportation speed and proper environmental control are critical to preserving quality, while the Kunming Flower Association (2023) reported that inadequate packaging and delivery delays often result in customer complaints and reduced repurchase intentions.

Despite growing scholarly attention to fresh food and agricultural e-commerce, research specifically addressing fresh cut flower e-commerce remains limited. This is particularly significant given that Yunnan Province accounts for over 70% of China's fresh cut flower production and plays a leading role in the global market (Yunnan Provincial Department of Agriculture, 2022). The scarcity of targeted studies highlights the need to explore how logistics service quality influences customer satisfaction in this sector. Addressing this gap not only enriches academic understanding but also offers practical guidance for improving logistics performance and consumer trust in the fresh-cut flower e-commerce industry.

2.3 Conceptual framework

Based on the literature reviewed in the preceding chapter, this study develops a conceptual framework to examine the relationship between logistics service quality and customer satisfaction in the context of fresh-cut flower e-commerce in Yunnan

Province. The framework is primarily grounded in the SERVQUAL model proposed by Parasuraman et al. (1988), which identifies five key dimensions of service quality: Reliability, Responsiveness, Assurance, Empathy, and Tangibles. These dimensions have been widely applied in logistics and e-commerce research and are considered critical determinants of customer perceptions and evaluations of service performance.

The framework positions customer satisfaction as the outcome variable, reflecting consumers' overall evaluation of logistics services after comparing their expectations with actual delivery experiences. So the study constructs the conceptual framework as shown in Figure 2.1.

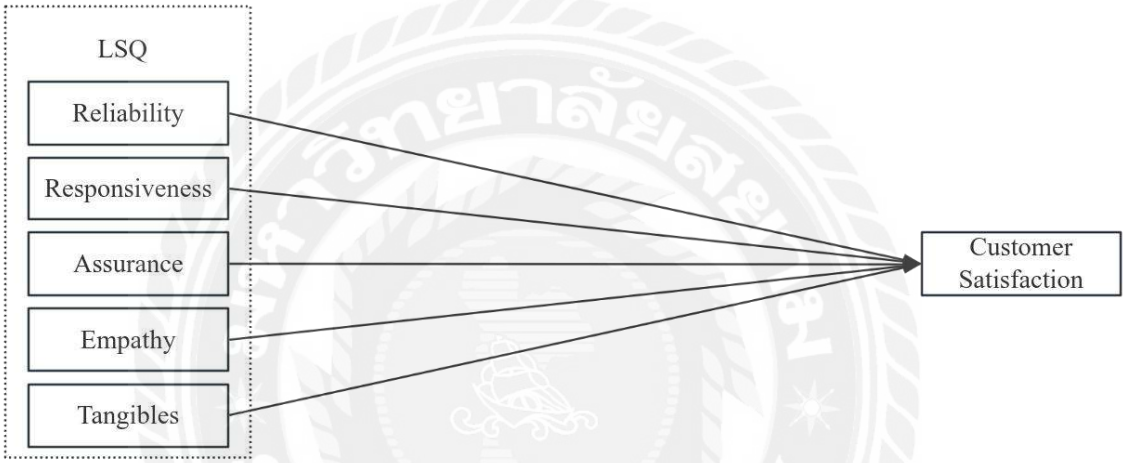

Figure 2.1 Conceptual Framework

Chapter 3 Research Methodology

3.1 Introduction

This study employed a quantitative research design to examine the impact of e-commerce logistics service quality on customer satisfaction in Yunnan's fresh-cut flower sector. A structured questionnaire was developed based on the SERVQUAL model, covering five key dimensions: Reliability, Responsiveness, Assurance, Empathy, and Tangibles. The survey was conducted both online and offline in March 2025, yielding a total of 508 valid responses.

The questionnaire consisted of two sections: demographic information and a five-point Likert scale used to measure each variable. The scale was pre-tested and translated to ensure clarity and accuracy. Data analysis was carried out using SPSS for descriptive statistics and AMOS for structural equation modeling.

This approach allowed for the simultaneous examination of both the measurement and structural models, enabling verification of the reliability and validity of the scale as well as testing the causal relationships among latent variables. Compared with alternative methods, AMOS provides a comprehensive set of model fit indices (e.g., X^2/df, CFI, TLI, RMSEA, SRMR), which facilitates an in-depth evaluation of model-data fit and ensures the robustness and reliability of research findings. All five hypotheses were tested, thereby offering a solid empirical basis for understanding how each dimension of logistics service quality influences customer satisfaction.

3.2 Research Design

The independent variables of this study consist of the five dimensions of logistics service quality—Reliability, Responsiveness, Assurance, Tangibles, and Empathy—while the dependent variable is customer satisfaction. Data were collected through a structured questionnaire survey. All measurement scales were adapted from established and authoritative sources relevant to the research context, and multiple rounds of translation and proofreading were conducted by professionals to ensure accuracy and consistency.

The survey was administered between March 12 and March 31, 2025. The questionnaire contained a total of 13 questions divided into two sections. The first section captured respondents' demographic information and e-commerce usage patterns, including gender, age, education level, monthly income, preferred e-commerce platforms, length of experience in purchasing fresh-cut flowers online,

and frequency of monthly purchases. The second section formed the main body of the questionnaire and employed a five-point Likert scale to measure each variable, with response options ranging from 1 = strongly disagree to 5 = strongly agree (Grosch et al., 2023). A pilot test was conducted prior to the formal survey to refine the questionnaire. In total, 531 questionnaires were collected, of which 23 were excluded due to invalid responses, resulting in 508 valid questionnaires for final analysis.

3.2.1 Logistics Service Quality Scale

Drawing on the SERVQUAL model and incorporating insights from several scholars—Yi & Shi (2022), Zhang (2022), Li (2013), Jiang (2021), and Chen (2018) — this study reviewed, refined, and analyzed measurement items related to logistics service quality. Based on this process and considering the specific characteristics of fresh cut flower e-commerce logistics, logistics service quality was classified into five dimensions: Reliability, Responsiveness, Assurance, Empathy, and Tangibles.

Reliability refers to the ability to perform promised services accurately and consistently. Responsiveness denotes the ability to respond quickly to customer needs and to resolve problems in a timely manner. Assurance reflects professional competence and trustworthiness, ensuring that customers have confidence in the safety and reliability of the service. Empathy represents the extent to which service providers put themselves in the customer's position, offering personalized services and demonstrating understanding and care. Tangibles encompass the physical aspects of the service process, such as facilities, the appearance of personnel, and the presentation of promotional materials.

As presented in Table 3.1, these five dimensions provide the basis for measuring logistics service quality in the context of fresh-cut flower e-commerce.

Table 3.1 Logistics Service Quality Scale

Dimension	Items	Source
Reliability（RL）	I received a product that is consistent with the image shown at the time of purchase.	Yi (2022)
	I received the product accurately and on time as promised.	
	I received the product with its outer packaging intact.	
	I received fresh-cut flowers that were in good condition and fresh.	
	I experienced that the seller fulfilled the return and exchange service as promised.	

Responsiveness (RS)	The seller processes and ships orders quickly.	Zhang (2022)
	The platform updates the logistics information promptly after the order is placed.	
	The seller handles after-sales issues in a timely manner.	
	The courier network is widely distributed and delivers efficiently.	
Assurance (AS)	I feel that the customer service staff have strong communication and coordination skills.	Li （2013）
	I trust that my shopping information is kept confidential.	
	I am reminded by the delivery personnel to inspect the goods upon receipt.	
	I find the insurance terms easy to understand and the charges reasonable.	
	I receive the platform's promised services on time.	
Empathy (EP)	The logistics company's staff are able to communicate well with customers.	Jiang (2021)
	The logistics personnel demonstrate a good attitude during the service process.	
	The logistics service takes full consideration of customer needs.	
	The logistics company provides personalized services.	
	The logistics company takes the initiative to offer additional services.	
Tangibles (TG)	I saw that logistics staff wore uniforms with clear company logos.	Chen (2018)
	I received my order in professional cold chain packaging.	
	I had access to refrigerated lockers or other cold storage when receiving my order.	
	I experienced smart logistics in collection, transport, and delivery.	
	I found the company's outlets clean and well-organized.	

3.2.2 Customer Satisfaction Scale

The dependent variable of this study is customer satisfaction, specifically focusing on customer satisfaction with logistics service quality. The measurement items were adapted with reference to the classification of customer satisfaction

proposed by Chen Jie (2018). The specific items and their corresponding numbers are presented in Table 3.2.

Table 3.2 Customer Satisfaction Scale

Dimension	Items	Source
Customer Satisfaction (CS)	I feel that the logistics service exceeded my expectations.	Chen Jie (2018)
	I trust the quality of fresh flowers bought online because of the platform's logistics.	
	I am satisfied with buying fresh-cut flowers on the platform.	
	I can tolerate small issues in logistics service.	
	I prefer the platform's logistics service when buying fresh-cut flowers.	
	I will keep buying fresh-cut flowers through the platform.	

3.3 Hypothesis

Based on the literature discussed above and the analysis of factors that may affect customer satisfaction in the e-commerce logistics services of fresh-cut flowers in Yunnan Province, the five dimensions of logistics service quality (reliability, responsiveness, assurance, tangibles, and empathy) directly influence customer satisfaction. Therefore, the following hypotheses are proposed:

H1: Reliability has a significant impact on customer satisfaction.

H2: Responsiveness has a significant impact on customer satisfaction.

H3: Assurance has a significant impact on customer satisfaction.

H4: Empathy has a significant impact on customer satisfaction.

H5: Tangibles have a significant impact on customer satisfaction.

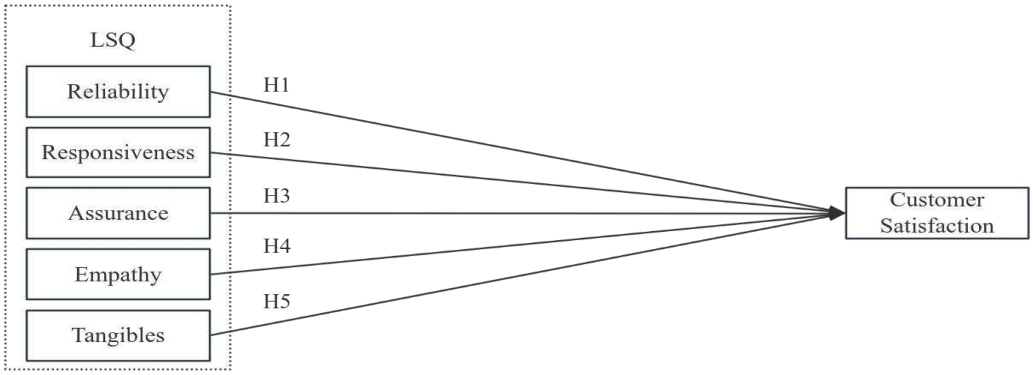

Figure 3.1 Hypotheses

3.4 Population, Sampling and Sample Size

In this study, Taro Yamane's table was used for sample selection. Taro Yamane explains an alternative to Cochran's method for calculating sample size from a population.

$$n = \frac{N}{1 + N(e^2)}$$

In this study, N represents the total population size, n represents the sample size, and e represents the precision level. Therefore, according to Taro Yamane's sample size table, with a precision level (e) of 5%, a p-value of 0.5, and a 95% confidence level, the required sample size was 384.

3.5 Data Collection

This study employed a questionnaire survey to collect data. The independent variables include the reliability, responsiveness, assurance, empathy, and tangibles of logistics service quality, with customer satisfaction as the dependent variable. The questionnaires were distributed using a combination of online and offline methods to enhance data coverage and validity.

For online distribution, the survey was administered via the "WJX" professional platform, a leading online survey tool in China with mature systems for questionnaire design, distribution, and collection. Targeting specific demographic profiles, encrypted questionnaire links and QR codes were disseminated through social media platforms, allowing respondents to complete the survey anonymously online. For offline distribution, paper-based questionnaires were administered using random sampling at e-commerce platforms, logistics companies, and fresh-cut flower enterprises. These were distributed on-site at major flower markets and logistics hubs in Yunnan Province to capture diverse perspectives and experiences.

Respondents included four categories of stakeholders: customers, e-commerce platform operators, logistics service providers, and fresh-cut flower enterprises. The entire survey process was conducted anonymously, and the collected data were used solely for this research to ensure authenticity and reliability.

Rigorous quality control was applied to the survey samples. Collected questionnaires were screened to eliminate invalid responses. Ultimately, out of 531 questionnaires distributed, 508 valid responses were obtained, resulting in a valid recovery rate of 95.7%, which met the predetermined requirements for data collection.

3.6 Data Analysis

This study adopted a quantitative research method, collecting data through a questionnaire survey. Upon completion of data collection, Structural Equation Modeling (SEM) was employed to test the research model and hypotheses. The analysis was conducted using the software packages SPSS and AMOS.

To understand the characteristics of the respondents, descriptive statistical analysis was performed using SPSS. Basic statistical information about the sample (e.g., age, education level) is presented in the form of frequency and percentage tables.

Regarding the model analysis, this study employed Structural Equation Modeling and utilized the AMOS software for estimation. This approach can simultaneously handle the measurement model and the structural model, allowing for the validation of the scale's reliability and validity, as well as testing the causal relationships among latent variables. Compared to other methods, AMOS provides a comprehensive set of model fit indices (e.g., X^2/df, CFI, TLI, RMSEA, SRMR), enabling a thorough assessment of the model's fit with the data, thereby ensuring the reliability and robustness of the research findings.

3.7 Reliability Analysis

Cronbach's alpha is a metric used to assess the reliability of questionnaires and is widely applied in the analysis of empirical data. Generally, when the Cronbach's alpha value of a scale falls below 0.7, it indicates poor internal consistency among the variables in the scale, suggesting a need for revision. A value above 0.7 signifies good internal consistency among the variables constituting the scale. If the Cronbach's alpha value exceeds 0.9, it reflects excellent internal consistency among the variables designed in the scale.

The Cronbach's alpha values were 0.876 for Reliability, 0.854 for Responsiveness, 0.882 for Assurance, 0.876 for Empathy, 0.867 for Tangibles, and 0.904 for Customer Satisfaction. All values exceeded the threshold of 0.8, indicating high stability and internal consistency of the scale. These results demonstrate excellent reliability of the survey questionnaire, as shown in Table 3.3.

Table 3.3 Variable Reliability Test

Construct	Cronbach's α	N of Items
Reliability	0.876	5
Responsiveness	0.854	4
Assurance	0.882	5
Empathy	0.876	5
Tangibles	0.867	5
Customer Satisfaction	0.904	6

3.8 Validity Analysis

Validity analysis measures how closely results align with intended goals, helping understand measurement error and effectiveness. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity are common methods to assess sample data correlation and suitability for factor analysis. KMO values between 0.7-0.8 indicate a well-designed scale suitable for factor analysis; values >0.8 indicate excellent suitability. A significant Bartlett's test (Sig. < 0.05) indicates variable correlations, allowing factor analysis. The study's KMO value was 0.927, indicating excellent suitability for factor analysis. Bartlett's test showed an approximate chi-square of 8143.394 (Sig. < .001), confirming good validity structure and suitability for factor analysis. As shown in Table 3.4.

Table 3.4 KMO and Bartlett's Test Results

KMO Measure of Sampling Adequacy		0.927
Bartlett's Test of Sphericity	Approximate Chi-Square	8143.394
	Degrees of Freedom	435
	Sig.	0.000

Chapter 4 Findings

4.1 Introduction

This chapter analyze the empirical data to examine the impact of the five dimensions of logistics service quality on customer satisfaction and to test the validity of the research hypotheses proposed in this study. Based on 508 valid questionnaires, this study employed structural equation modeling using AMOS to construct and analyze the measurement and structural models.

First, descriptive statistical analysis of respondents' demographic characteristics was conducted to clarify the sample composition and representativeness. Next, the reliability and validity of each latent variable were assessed to ensure the scientific rigor of the measurement instruments and the quality of the data. Finally, through path coefficient analysis, significance testing, and effect size evaluation, the study investigated the direct effects of the five dimensions of logistics service quality—Reliability, Responsiveness, Assurance, Empathy, and Tangibles—on customer satisfaction.

The findings of this chapter not only provide empirical support for hypothesis testing but also establish the theoretical foundation for practical recommendations in the following chapter. By analyzing the structural relationships among variables, this chapter further reveals the underlying mechanisms through which logistics service quality influences consumer experience and satisfaction in Yunnan's fresh-cut flower e-commerce sector, thereby offering scientific evidence for enterprises to optimize service processes and develop effective strategies.

4.2 Descriptive Statistics of Respondents

A total of 508 valid questionnaires were collected for this study. The analysis of respondents' background information is divided into two parts: the first part presents basic demographic characteristics, and the second part focuses on e-commerce consumption behavior. The demographic information covers four aspects—gender, age, education level, and monthly income—which were analyzed using SPSS through descriptive statistics. The detailed statistical results are presented in Table 4.1.

Table 4.1 Descriptive Statistics of Respondents

Characteristic	Option	Percentage（%）
Gender	Male	51.6
	Female	48.4
Age	<=18	12
	19-29	33.9
	30-39	22.8
	40-49	16.1
	>=50	15.2
Education Level	High school and below	20.3
	Associate degree	19.7
	Bachelor's degree	43.9
	Master's degree and above	16.1
Monthly Income (RMB)	<=3000	12
	3001-5000	19.1
	5001-8000	31.9
	8001-10000	20.9
	>=10000	16.1
Frequently Used E-commerce Platforms	Taobao Mall	11.8
	JD Mall	52
	Tmall	78
	Meituan	77.6
	Hema Fresh	75.2
	Pinduoduo	31.9
	Douyin	20.9
	Kuaishou	15.6
	Other	11
Use of E-commerce to Buy Fresh Cut Flowers (time/years)	<2	18.7
	2-4	39.4
	4-6	27.8
	>6	14.2
E-commerce Flower Purchase Frequency（monthly）	1-2 times	26
	3-5 times	46.5
	5-7 times	17.7
	>7 times	9.8

This study included a total of 508 valid samples. Among the respondents, 51.6% were male and 48.4% were female, indicating a relatively balanced gender distribution. The primary consumer group was aged 19 – 29, accounting for 33.9% of the total sample, followed by the 30 – 39 age group at 22.8%. Excluding minors, respondents aged 50 and above accounted for the smallest proportion (15.2%), suggesting that young consumers dominate the fresh cut flower e-commerce market, although there remains potential for development in the middle-aged and elderly segments. Regarding education level, the majority of respondents held a bachelor's degree or higher (60%). In terms of monthly income, the largest group fell within the 5,001 – 8,000 RMB range, representing 31.9% of respondents.

As shown in Table 4.1, for the multiple-choice question on " most frequently used e-commerce platforms" , most consumers reported using two or more platforms to purchase fresh-cut flowers. Tmall was the most frequently used platform, chosen by 78% of respondents, followed closely by Meituan Youxuan at 77.6%. In contrast, social commerce platforms such as Douyin and Kuaishou showed relatively low penetration in the fresh-cut flower sector, indicating room for further growth.

Among the 508 consumers who had purchased fresh-cut flowers via e-commerce platforms, the majority reported using such platforms for 2 – 4 years (39.4%), while only 14.2% had more than six years of experience. In terms of purchase frequency, 46.5% of respondents reported buying fresh cut flowers three to five times per month, suggesting that flower consumption is shifting from being primarily seasonal or holiday-driven to becoming a part of daily consumption, with stable repurchase habits already forming among users.

4.3 Results of the Study

This study used the structural equation model analysis software AMOS to test the path coefficients and hypotheses of the model. The model fitting of the validation factor analysis scale was tested. The data collected from the questionnaire were imported into the AMOS software, and the model fitting parameters obtained using the maximum likelihood method are shown in the table below.

Table 4.2 Model Fitting Index

Model fitting	X^2/df	NFI	RFI	IFI	TLI	CFI	GFI	RMSEA
Fitting results	1.163	0.945	0.939	0.992	0.991	0.992	0.945	0.018
Judgment values	<3	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08

Correlation analysis, as a means and tool for measuring the strength of statistical relationships between things, aims to measure the strength of linear correlations between variables. In correlation analysis, the focus is on the strength and direction of the direct linear correlation between two variables. At the same time, the degree of linear correlation between variables is generally described by the correlation coefficient R, and the positive or negative value of the correlation coefficient R indicates the direction of direct linear correlation between the two variables. R>0 indicates positive correlation, R<0 indicates negative correlation, and R=0 indicates zero correlation. The absolute value of R indicates the closeness of the linear correlation between the two variables. The closer the absolute value of R is to 1, the higher the closeness. The closer the absolute value of R is to 0, the less close it is. The Pearson correlation coefficient, also known as the product-difference correlation coefficient, is a commonly used metric for quantitatively describing the quality of a linear correlation.

Table 4.3 Pearson Correlation Analysis Results

	Reliability	Responsiveness	Assurance	Empathy	Tangibles	Customer satisfaction
Reliability	1					
Responsiveness	0.426 * *	1				
Assurance	0.417 * *	0.373 * *	1			
Empathy	0.411 * *	0.396 * *	0.309 * *	1		
Tangibles	0.246 * *	0.285 * *	0.239 * *	0.286 * *	1	
Customer satisfaction	0.400 * *	0.372 * *	0.356 * *	0.443 * *	0.311 * *	1

* p<0.05 ** p<0.01

As shown in table 4.3, correlation analysis was conducted to examine the correlations among the five items of customer satisfaction, reliability, responsiveness, assurance, empathy, and tangibles, and the Pearson correlation coefficient were used to represent the strength of the correlations. The specific analysis showed that: Customer satisfaction showed significance correlation with the five items of reliability, responsiveness, assurance, empathy, and tangibles, with correlation values of 0.400, 0.372, 0.356, 0.443, and 0.311, respectively, and all correlation values were greater than 0. This indicates a positive correlation between customer satisfaction and reliability, responsiveness, assurance, tangibility, and empathy.

This study used the AMOS software to test the hypothesized relationships in the research model. The results of the path analysis are shown in Table 4.4. From Tables

4.4 and 4.5, the following conclusions can be drawn:

(1) The standardized path coefficient of reliability on customer satisfaction intention is 0.159, with a p-value less than 0.01. Therefore, reliability has a positive direct impact on customer satisfaction, supporting hypothesis H1.

(2) The standardized path coefficient of responsiveness on customer satisfaction intention is 0.114, with a p-value less than 0.05. Therefore, responsiveness has a positive direct impact on customer satisfaction, supporting hypothesis H2.

(3) The standardized path coefficient of assurance on customer satisfaction intention is 0.138, with a p-value less than 0.01. Therefore, assurance has a positive direct impact on customer satisfaction, supporting hypothesis H3.

(4) The standardized path coefficient of empathy on customer satisfaction intention is 0.273, with a p-value less than 0.001. Therefore, empathy has a positive direct impact on customer satisfaction, supporting hypothesis H4.

(5) The standardized path coefficient of tangibles on customer satisfaction intention is 0.147, with a p-value less than 0.01. Therefore, tangibles have a positive direct impact on customer satisfaction, supporting hypothesis H5.

Table 4.4 Path verification result

Path	S.E.	C.R.	P	Standardized path coefficients
RL→CS	0.055	2.845	0.004**	0.159
RS→CS	0.061	2.055	0.040*	0.114
AS→CS	0.049	2.697	0.007**	0.138
EP→CS	0.050	5.095	***	0.273
TG→CS	0.054	3.116	0.002**	0.147

Note: *P<0.05, **P<0.01, ***P<0.001.

Table 4.5 Structural Equation Model Test Results

Hypothesis	Standardized path coefficient	Result
H1: Reliability has a significant impact on customer satisfaction.	0.159	Supported
H2: Responsiveness has a significant impact on customer satisfaction.	0.114	Supported
H3: Assurance has a significant impact on customer satisfaction.	0.138	Supported
H4: Empathy has a significant impact on customer satisfaction.	0.273	Supported
H5: Tangibles have a significant impact on customer satisfaction.	0.147	Supported

Chapter 5 Conclusion and Recommendation

5.1 Introduction

This chapter summarizes the major findings of the study and presents corresponding recommendations. Based on the analysis of 508 valid questionnaires and the application of structural equation modeling with AMOS, the research tested the five hypotheses concerning the impact of logistics service quality on customer satisfaction in Yunnan's fresh-cut flower e-commerce sector. The findings provide both theoretical insights into the role of logistics service quality dimensions and practical implications for e-commerce platforms and logistics providers. The chapter is divided into two main parts: the first presents the conclusions drawn from the study, and the second proposes recommendations for improving logistics service quality and enhancing customer satisfaction.

5.2 Conclusion

5.2.1 The significant impact of logistics service quality dimensions on customer satisfaction

Taking Yunnan's fresh cut flower e-commerce sector as the research context, this study constructed a measurement scale based on the SERVQUAL model and conducted an empirical analysis of the impact of five logistics service quality dimensions on customer satisfaction. The results confirm that all five dimensions exert a significant positive influence on customer satisfaction, leading to the following conclusion:

All five hypotheses (H1–H5) were supported, indicating that each dimension of logistics service quality significantly and positively affects customer satisfaction. The results of the structural equation modeling further demonstrate that all five path hypotheses were validated, confirming that customers' overall perceptions of logistics service quality play a decisive role in shaping their satisfaction when purchasing fresh cut flowers through e-commerce platforms.

5.2.2 Key dimensions of logistics service quality affecting customer satisfaction

Among the five dimensions, Empathy showed the highest standardized path coefficient ($\beta = 0.273$, $p < 0.001$). This suggests that personalized services, proactive communication, and attention to consumer needs are critical factors shaping satisfaction in perishable product delivery. Consumers value being understood and cared for, especially when purchasing delicate items such as fresh-cut flowers. Assurance ($\beta = 0.138$, $p < 0.01$) and Tangibles ($\beta = 0.147$, $p < 0.01$) were found to have substantial impacts on satisfaction. This highlights the importance of professional, trustworthy service personnel, clear communication, and visible quality cues such as professional packaging, cold chain storage, and the physical presentation of products. Reliability ($\beta = 0.159$, $p < 0.01$) and Responsiveness ($\beta = 0.114$, $p < 0.05$) were also supported, confirming that timely delivery, order accuracy, quick issue resolution, and efficient logistics handling are indispensable for reducing risks of dissatisfaction in fresh cut flower transactions.

5.3 Recommendation

5.3.1 The reliability dimension of logistics service quality

E-commerce platforms and logistics providers should strengthen reliability by ensuring accurate and timely delivery of orders. This can be achieved by improving order management systems, adopting advanced tracking technologies, and collaborating with multiple logistics partners to minimize disruptions. Building a reputation for consistent and dependable service will enhance consumer trust and satisfaction.

5.3.2 The responsiveness dimension of logistics service quality

To improve responsiveness, companies should establish efficient customer service mechanisms that allow for real-time communication and rapid problem resolution. Offering 24/7 online support, implementing chatbots or AI-driven response systems, and ensuring prompt handling of complaints can increase customers' confidence in the logistics process and reduce dissatisfaction when service failures occur.

5.3.3 The assurance dimension of logistics service quality

Assurance can be reinforced by improving the professionalism and competence of logistics staff. Regular training programs should be provided to enhance employees' knowledge of product handling, customer service etiquette, and problem-solving skills. Furthermore, transparent service policies, such as insurance coverage for damaged products, can increase customer confidence and trust in the logistics system.

5.3.4 The empathy dimension of logistics service quality

Given that empathy was found to be the most influential factor in this study, platforms should focus on delivering personalized and customer-centered services. Flexible delivery options, proactive updates, and tailored service offerings (e.g., reminders for special occasions such as Valentine's Day or anniversaries) can help customers feel valued and understood. Such strategies not only enhance satisfaction but also foster long-term loyalty.

5.3.5 The tangibles dimension of logistics service quality

Tangibles should be improved by investing in high-quality packaging, professional branding, and modern cold chain facilities. Packaging materials should ensure both protection and aesthetic appeal, preserving the freshness and presentation of flowers upon delivery. In addition, clean and branded delivery vehicles and staff uniforms can serve as visible cues of service quality, positively shaping customer perceptions.

5.3.6 Policy and industry-level suggestions

The government and industry associations in Yunnan should support infrastructure development, particularly in cold chain logistics, and encourage collaboration among growers, logistics providers, and platforms. This will reduce losses, improve efficiency, and promote the sustainable growth of the fresh-cut flower e-commerce industry.

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Appendix

Questionnaire

Survey on E-commerce Logistics Service Quality and Customer Satisfaction for Fresh Cut Flowers in Yunnan Province

Dear Participant：

Greetings, and thank you for your participation in this survey. This questionnaire is conducted anonymously, and the data collected will be used solely for academic research. All your personal information will be kept strictly confidential. There are no right or wrong answers; if you find any particular question difficult to answer or unclear, you may skip it. The accuracy of your responses is crucial to the validity of our research; therefore, we sincerely appreciate your careful and honest input.

This study focuses on "fresh cut flowers"—defined as fresh flowers cut from the plant, including roses, lilies, carnations, eustomas, and other live floral materials used for bouquets and decoration. It specifically investigates the logistics service quality and post-purchase consumer experience of fresh cut flowers directly supplied from Yunnan Province and sold via e-commerce platforms (such as Taobao, Douyin, Pinduoduo, etc.).

Please read each question carefully and provide your responses based on your actual experiences and perceptions.

Thank you once again for your valuable time and sincere contribution to this study.

Part 1: Basic personal information

1. What is your gender?

A. Male B. Female

2. What is your age?

A. <=18 years old B. 19-29 years old C. 30-39 years old D. 40-49years old E. >=50 years old

3. What is your highest level of education?

A. High school and below B. Associate degree C. Bachelor's degree D.Master's degree and above

4. What is your monthly income（RMB）?

A. <=3000 B.3001-5000 C.5001-8000 D.8001-10000 E. >=10000

5. Which are the most frequently used fresh-cut flower e-commerce platforms for you (multiple choices are allowed)?

A. Taobao Mall

B. JD Mall
C. Tmall
D. Meituan
E. Hema Fresh
F. Pinduoduo
G. Douyin
H. Kuaishou
I. Other

6. How long have you been using e-commerce platforms to purchase fresh-cut flower products?

A. <2 years B. 2-4 years C. 4-6 years D. >6 years

7. How many times do you purchase fresh-cut flowers from e-commerce platforms on average each month?

A. 1-2 times B. 3-5 times C. 5-7 times D. >7 times

Part 2: Main body section

Please indicate your level of agreement with the following statements based on your actual experience and perceptions of purchasing fresh cut flowers via e-commerce platforms. Please select the option that best reflects your opinion using the scale below:

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Measuring item	**1**	**2**	**3**	**4**	**5**
Reliability（RL）					
I received a product that is consistent with the image shown at the time of purchase.					
I received the product accurately and on time as promised.					
I received the product with its outer packaging intact.					
I received fresh-cut flowers that were in good condition and fresh.					
I experienced that the seller fulfilled the return and exchange service as promised.					

Responsiveness (RS)					
The seller processes and ships orders quickly.					
The platform updates the logistics information promptly after the order is placed.					
The seller handles after-sales issues in a timely manner.					
The courier network is widely distributed and delivers efficiently.					
Assurance (AS)					
I feel that the customer service staff have strong communication and coordination skills.					
I trust that my shopping information is kept confidential.					
I am reminded by the delivery personnel to inspect the goods upon receipt.					
I find the insurance terms easy to understand and the charges reasonable.					
I receive the platform's promised services on time.					
Empathy (EP)					
The logistics company's staff are able to communicate well with customers.					
The logistics personnel demonstrate a good attitude during the service process.					
The logistics service takes full consideration of customer needs.					
The logistics company provides personalized services.					
The logistics company takes the initiative to offer additional services.					
Tangibles (TG)					
I saw that logistics staff wore uniforms with clear company logos.					
I received my order in professional cold chain packaging.					
I had access to refrigerated lockers or other cold storage					

when receiving my order.					
I experienced smart logistics in collection, transport, and delivery.					
I found the company's outlets clean and well-organized.					
Customer Satisfaction (CS)					
I feel that the logistics service exceeded my expectations.					
I trust the quality of fresh flowers bought online because of the platform's logistics.					
I am satisfied with buying fresh-cut flowers on the platform.					
I can tolerate small issues in logistics service.					
I prefer the platform's logistics service when buying fresh-cut flowers.					
I will keep buying fresh-cut flowers through the platform.					