



Research on a Two-Dimensional Model of Customer Satisfaction

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Abstract

Background and Aim: Important service management theory research topics include customer orientation, reducing customer complaints, and pursuing customer satisfaction. The majority of customer satisfaction surveys and analyses overlook the effect of the discrete distribution of each evaluation item on the overall uncertainty of customer satisfaction evaluation, which makes it challenging to provide thorough and accurate information. Currently, customer satisfaction surveys are widely used to evaluate service quality quantitatively. Simultaneously, the quality of service provided by college student apartments will impact social and campus stability, so analyzing satisfaction metrics is crucial. This paper aims to (1) establish a two-dimensional indicator model for customer satisfaction and perceived quality standard deviation, expanding the single dimension into two dimensions, and (2) improve the service of college student apartments to avoid the occurrence of crisis events.

Methodology: The study employs a rigorous quantitative approach, supported by theoretical analysis and validated through iterative testing of the questionnaire. This ensures the conceptual model is robust, and the final survey instrument is both reliable and valid for comprehensive data collection.

Results: This study identifies current issues, presents the concept of standard deviation based on accepted theories of customer satisfaction and service quality, and summarizes research findings in customer satisfaction, service quality, customer complaints, etc. Customer satisfaction (CS) is the first dimension in a two-dimensional model of customer satisfaction, and perceived quality standard deviation (SD) is the second dimension. For a more thorough assessment of customer satisfaction, a "four-interval" chart is suggested. This study developed a two-dimensional model of customer satisfaction for college student apartments using expert interviews and statistical analysis. This study simultaneously screened and processed the actual survey questionnaire data, developed a data processing program, and proposed a mathematical model.

Conclusion: In addition to conducting a correlation analysis between customer satisfaction, quality standard deviation, and the number of student complaints in college student apartments, this study shows how effective a two-dimensional model for customer satisfaction is in these settings.

Keywords: Customer Satisfaction; Customer Complaints; College Student Apartment

Introduction

The success and sustainability of businesses in a variety of industries are significantly impacted by the fundamental ideas of customer satisfaction and service quality in service management. While service quality includes the overall evaluation of the service experience, customer satisfaction measures how well a product or service meets or surpasses the expectations of the customer. These ideas have historically been closely related, with service quality frequently regarded as a key factor in determining customer satisfaction (Hussain et al., 2021). These constructs have their roots in marketing and service theories, which highlight the importance of comprehending and meeting customer needs to maintain a devoted clientele and gain a competitive edge. Customer satisfaction and service quality have become key areas of focus in modern service industries, from hospitality to healthcare, since they have a significant impact on customer retention, referrals, and ultimately revenue. This is because these factors are crucial in forming customers' perceptions.

Due to its direct correlation with customer loyalty, favorable word-of-mouth, and organizational profitability, customer satisfaction is crucial. According to studies, happy customers are more likely to stick with a business, make repeat purchases, and refer others to it, all of which are good for its finances and reputation (Ali et al., 2022). Furthermore, a company's ability to keep a competitive edge in crowded markets is greatly influenced by customer satisfaction. Accurately measuring customer satisfaction is crucial as businesses work to deliver value to consumers through high-quality goods and outstanding customer service. Understanding customer satisfaction levels enables businesses to close gaps and enhance





service quality over time, ultimately increasing long-term sustainability. Happy customers are also less likely to switch to competitors (Nguyen & Tran, 2023).

Since service quality directly affects customer satisfaction and perceptions, it plays an equally important role. In addition to increasing customer satisfaction, high service quality also fosters customer trust and strengthens brand loyalty (Wang & Zhang, 2023). A popular tool for assessing service quality along dimensions like responsiveness, assurance, and dependability is the SERVQUAL model, which was created by Parasuraman et al. The pressure to continuously provide high-quality services increases as customer expectations change. Research indicates that better service quality builds stronger customer relationships and positive customer experiences, which boosts an organization's standing in the marketplace. With major ramifications for customer retention and competitive differentiation, service quality is therefore a crucial component of organizational success and a major driver of customer satisfaction (Singh et al., 2020).

However, this section constructs a two-dimensional model of customer satisfaction, with the first dimension being customer satisfaction (CS) and the second dimension being perceived quality standard deviation (SD). Based on the characteristics of college student apartments, a customer satisfaction model for college student apartments is established. By applying the model in the service and management of college student apartments, the significance of the model can be explored. Based on the customer satisfaction evaluation results, targeted improvements can be made to the service quality related to college student apartments, forming a sustainable customer satisfaction evaluation mechanism.

In the field of management science, customer satisfaction is the most universal. Regardless of the branch of management science or the research question, the ultimate goal is customer satisfaction. It is the intersection of comprehensive quality management and an important basis for enterprises to establish standards. Customer satisfaction can generate positive marketing effects and is also an important aspect of corporate strategic management, such as promoting repeat purchases, influencing customer retention and loyalty, and enhancing market share and profitability. These positive effects have become an important source of core competitive advantage for enterprises, so more and more companies are using customer satisfaction as a performance indicator for the success of their corporate strategies. Managers generally focus on the weighted average level of each evaluation item of customer satisfaction (customer satisfaction index) and ignore the impact of the discrete distribution of each evaluation item of customer satisfaction on the uncertainty of customer satisfaction evaluation.

With the development of the economy, social production has gradually shifted from the primary industry to the secondary and tertiary industries. The "Standard Industrial Classification of Economic Activities" published by the United Nations divides the service industry into 11 categories, including commercial, retail, hotel, and tourism industries. The service industry is an important industry for developing the economy, creating social wealth, and meeting social needs. The National Bureau of Statistics of China has issued the "Regulations on the Classification of the Three Industries", which stipulates that China's tertiary industry includes 14 categories such as transportation, warehousing, and postal services. Customer satisfaction evaluation is of great significance for the healthy development of the expanding tertiary industry. Determine the causal relationship between customer satisfaction, hypothesize the causal relationship between quality factors that affect customer satisfaction and customer satisfaction, use the structural equation method to verify, obtain the current status and causal relationship strength of each quality factor, and provide direction for service improvement. The research in this article can not only comprehensively and accurately characterize customer satisfaction, but also further indicate the direction of improving service quality, thereby scientifically guiding the improvement of service quality, increasing customer satisfaction, reducing the number of complaints, enhancing the brand image of the enterprise, thereby enhancing core competitiveness and creating economic and social benefits for the development of the enterprise.

Fu Zhenfang conducted a customer satisfaction survey on nearly 700 students from five universities in Guangxi and Hubei. Among them, 47.66% of students were dissatisfied with their accommodation. Peng Xuejun's sampling questionnaire of 262 student managers from eight universities showed that among the





25 single crisis factors of crisis events among college students, satisfaction with logistics service work ranked seventh. Among them, 52.9% believed that customer satisfaction with logistics service was an important factor, and 32.5% considered it more important. With the gradual establishment of China's socialist market economy system and the development of universities, the drawbacks of the original university logistics system and mechanism have become increasingly prominent. The traditional university logistics support system has become a bottleneck for China to implement the goal of popularizing higher education. Currently, in the transition from a planned economy to a market economy, the socialization reform of university logistics is being vigorously promoted, and it is particularly necessary to scientifically and comprehensively evaluate the quality of logistics services. This paper also has important theoretical and practical significance for improving university logistics work and student apartment services, and avoiding crisis events.

The customer satisfaction of college student apartments directly affects the vital interests and mental state of students. From existing cases, the problem of student dissatisfaction in college student apartments has repeatedly become a trigger, triggering crisis events that affect campus stability and social stability. Moreover, with the increasing proportion of children and the continuous improvement of the average living standard in society, students' standards for apartment service quality continue to rise. College student apartments are gathering places for students' lives, and the quality of service and customer satisfaction have important political significance for maintaining campus stability and social stability. At the same time, students spend more than 8 hours a day in the apartment, and the apartment service work has a great impact on their lives and studies, even affecting their normal scientific research activities. By studying and analyzing the relationship between customer satisfaction and the number of customer complaints in college student apartments, student satisfaction can be effectively improved. Utilize customer satisfaction indicators to evaluate department performance and develop targeted service improvement plans. At present, the customer satisfaction model of college student apartments has been used as one of the basic evaluation indicators for cadres and staff. Based on the direction of service improvement, considering investment in funds, time, and other aspects, effective improvement plans have been formulated, and the direct effects of the improvement plans have been estimated.

Objective

1. To establish a two-dimensional indicator model for customer satisfaction and perceived quality standard deviation, expanding the single dimension into two dimensions.
2. To improve the service of college student apartments to avoid the occurrence of crisis events

Literature Review

This chapter mainly introduces the concepts and theories related to customer satisfaction, service quality, the uncertainty of customer satisfaction evaluation and customer complaints, satisfaction index models, past and present research, and various relevant statistical data related to the research topic on domestic and foreign academic websites. Through extensive literature reading and research, the relevant variables and various relationships between variables in this article have been summarized and extracted. The second chapter of this study includes the theoretical framework and hypotheses that can support this research, as well as the main research results of introducing customer satisfaction and service quality, customer satisfaction uncertainty and customer complaints, and typical customer satisfaction index models at home and abroad through journal reviews, and a brief review of relevant literature.

1. Customer Satisfaction and Service Quality

In 1965, Cardozo introduced the concept of customer satisfaction into the field of marketing. Related scholars highly recognize the significance of studying the Customer Satisfaction Index, but the definition of satisfaction varies greatly. According to existing literature analysis, the relevant literature on customer satisfaction can be mainly understood from two perspectives: one is from the perspective of transactions, which can be divided into specific transaction perspectives and cumulative perspectives; the other is from the perspective of customer psychology, which can be divided into cognitive perspectives and emotional



perspectives. Olshavshy and Miller explored the theory of expected differences and their impact on product performance, such as increased loyalty, positive word-of-mouth communication, and enhanced profitability (Anderson, Fornell, & Lehmann, 1994). Therefore, understanding and measuring customer satisfaction is crucial for businesses to achieve long-term success. Therefore, we propose a variable: Customer Satisfaction (CS).

Table 1 Literature related to customer satisfaction and customer satisfaction

years	Researcher	Main points and conclusions
1965	Cardozo	Start researching customer satisfaction and dissatisfaction.
1977	Wirtz & Miller	It is generated by comparing the customer's expected performance of a product or service with the perceived performance.
1982	Churchill & Suq [^] renant	It is the result of purchasing and using a product and is the psychological state produced by the buyer's comparison of the expected return and input cost.
1979	Howard Peter,	tend to compare the effects of a product after use with their
1990	Olson Engel,	perceptions before use. If the service results provided by the
1993	Blackwell Miniard	service provider are higher than the consumer's expectations of a certain service, the consumer will feel satisfied. On the contrary, if the effect of the service does not meet the consumer's expectations, the consumer will feel dissatisfied.
1991	Johnson & Fomell	A customer's overall evaluation of all purchasing experiences with a product or service can show a company's past, present, and future performance.
1994	Davis & Heineke	A function of the gap between expected perception and perceived comparison.
2015	Baloglu	Satisfaction is mainly an emotional response of customers after consumption.
2020	Jing Fengjie	The customer behavior observed in reality is only a "variant behavior" and not a "true" reflection of the customer's satisfaction level.
2021	Gao Chongyan	The uncertainty of customer satisfaction survey results has an important impact on managers' evaluation of the company's overall service quality.

The currently widely recognized definition of customer satisfaction in academia was proposed by Oliver, who believes that customer satisfaction is a psychological response of customers to the satisfaction they need and is a judgment of the performance of products and services or the degree to which products and services themselves meet their needs. Customer satisfaction is defined as "the customer's opinion on the degree to which a certain matter meets their requirements and expectations", where "requirements" include both "explicit and implicit needs or expectations that must be fulfilled", and "a certain matter refers to a specific event at a specific time based on each other's needs and expectations and the communication between relevant parties". Customer satisfaction refers to the degree to which customers meet their requirements for the products or services provided by a company and is a measure of customer satisfaction.

2. Domestic and international satisfaction index models

Foreign countries have researched the customer satisfaction index earlier. Sweden was the first country to conduct a nationwide customer satisfaction index survey. Professor Fornell of the National Center for Quality Research at the University of Michigan and others first built a causal Swedish Customer Satisfaction Barometer (SCSB) for Sweden. In 1994, SCSB was introduced to the United States and modified to establish the American Customer Satisfaction Index (ACSI). In 1999, the European Union

conducted the first evaluation of the European Customer Satisfaction Index (ECSI). Other countries have also conducted exploratory research on customer satisfaction indexes, such as Japan, Canada, Brazil, etc.

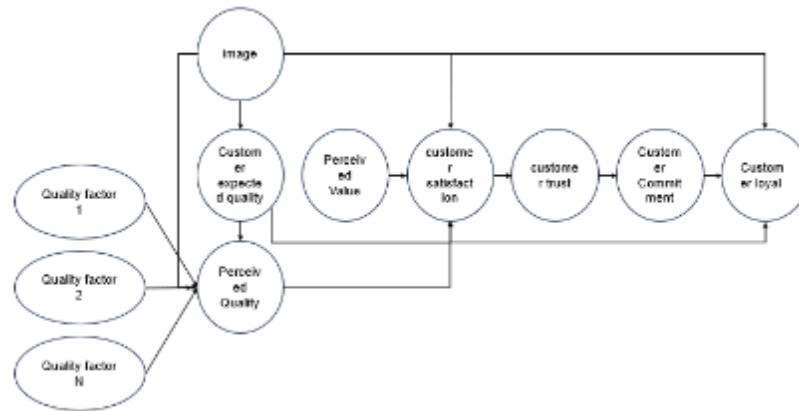


Figure 1 Common Customer Satisfaction Evaluation Methods

The methods of customer satisfaction evaluation include the Analytic Hierarchy Process, Fuzzy Comprehensive Method, Grey Relational Analysis, and Principal Component Analysis, and these methods are analyzed. Forming a hierarchical multi-index evaluation system. Furthermore, by establishing a pairwise comparison relationship matrix, the membership or weight of the next-level indicators relative to the previous-level indicators can be determined. Finally, based on the membership relationship, calculate the evaluation result of the overall goal from bottom to top. The Analytic Hierarchy Process is widely used, especially for problems where functional relationships cannot be determined. The Analytic Hierarchy Process can be used for both customer satisfaction evaluation and weight calculation. After determining the evaluation indicators and their corresponding weights, combined with customer rating results, the customer satisfaction level can be calculated.

Conceptual Framework

Combined with the above analysis, this research proposes the hypothesis that the service perception quality concept related to university student apartments has the following dimensions. Based on the above hypothesis, a customer satisfaction model for university student apartments is established, as shown in the figure:

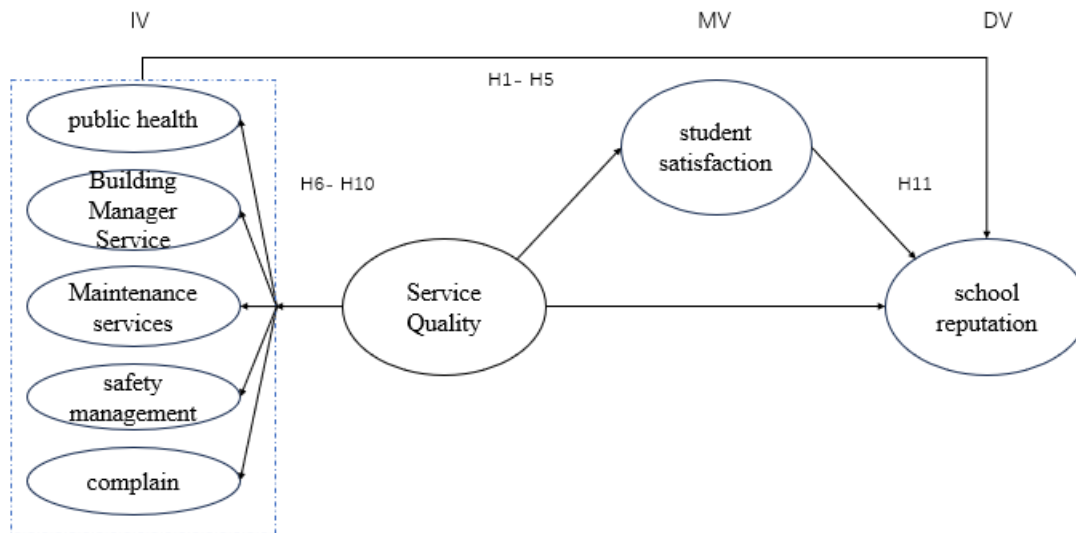


Figure 2 Conceptual Framework

Methodology

Based on the research objectives and content of this article, this study adopts a quantitative analysis research method. Construct a conceptual model through theoretical analysis, divide each variable dimension, and propose reasonable research hypotheses. Design questionnaire scales for each dimension based on relevant literature. By conducting preliminary research on the initial questionnaire, collecting questionnaire data on a small scale, processing the data to test the reliability and validity of the questionnaire, deleting or modifying unreasonable questionnaire items, and determining the final questionnaire for the survey.

1. Research Design

Based on the two-dimensional model of customer satisfaction, the research method is as follows. Firstly, the research ideas and steps are introduced. Secondly, the questionnaire design and sample selection are clarified. The focus is on how customer satisfaction surveys are conducted in student apartments, and methods such as data screening and missing data processing are introduced. Thirdly, methods such as structural equation modeling and principal component analysis used in empirical research are introduced. Finally, this article introduces the interval analysis of the number of student complaints, the sources of student complaints, and the correlation verification method.

Firstly, in December 2022, a pre-survey phase was conducted to conduct a small-scale questionnaire survey on relatively familiar undergraduate and graduate students. A stratified sampling method using nonprobability sampling was used for the survey, with 100 questionnaires distributed and 93 questionnaires collected, resulting in a questionnaire collection rate of 93%. After deleting invalid questionnaires, 91 valid questionnaires were finally obtained. The reliability and validity of the pre-survey questionnaire were analyzed, and some items were revised to form a formal questionnaire for formal research. In addition, regarding the overall data, to ensure scientific and effective data, this study adopts cluster sampling and snowball sampling methods, using a combination of online and offline data collection methods. The questionnaire was compiled online using the Wenjuanxing platform, and the questionnaire filling link was sent to the class leader, who then accurately forwarded it to relevant students for filling out. Offline, questionnaire surveys are mainly conducted through on-site research, and then the data is summarized.

2. Population and Sample

The selection of sampling methods plays a decisive role in the quality of survey results. According



to existing literature analysis, various sampling methods can be roughly classified into two categories: equal probability sampling and unequal probability sampling. The results of equal probability sampling surveys can not only infer overall parameters but also make accurate estimates of sampling errors, with high external validity and therefore high practical value. Non-equal probability sampling results cannot be accurately calculated for sampling error and have low external validity, so they do not have the value of inferring population parameters and should be used with special caution (Li Li, 2008).

This article aims to explore the impact of factors related to satisfaction with service management in college student apartments, including the number of universities and students in Beijing. As of 2022, according to the data released by the Beijing Municipal Bureau of Statistics, the number of students in Beijing is 4052189. Therefore, it is considered that the population is known, and this study adopts the Yamane formula (1973)

Calculate the sample using Yamane's formula as follows:

$$N=n/(1+Ne^2).$$

Among them:

N=sample size

N=overall size

E = represents the allowable error range

E is the difference between the estimated sample value and the true population value, usually ranging from 0.01 to 0.1. According to the actual situation of the research problem in this article, the difference between the estimated sample value and the true population value does not exceed 5%, so e is set to 0.05. Therefore, the overall N of this study is 4052189.

$$\text{When } N=4052189 \text{ When } e=0.05 \text{ } n =4052189/(1+4052189 (0.05^2))= 399.97$$

After calculation, the minimum sample size is 399.97, rounded to n=400.

3. Data Collection Methods

Data collection methods refer to the techniques, tools, and methods used to obtain data during the research process. The choice of data collection method depends on the research question, research design, and available resources. Researchers also need to pay attention to ethical and privacy issues to ensure the legality and confidentiality of data. This article mainly adopts the method of the survey questionnaire. When classifying survey groups, attention should be paid to minimizing differences within the same type and maximizing differences between different types. At the same time, there should be clear boundaries between different types to avoid confusion or omissions during classification. Specific operating steps: (1) According to the overall characteristics, divide the population into several groups according to certain standards. (2) Determine the total number of samples required and the number of samples to be extracted from each category of the population. (3) Randomly select the required number of samples from each category unit of the population.

The survey questionnaire consists of two parts: demographic information and the main body of the questionnaire, with a total of 35 items. The preface of the questionnaire mainly explains that the survey questionnaire is designed to clarify the research topic and purpose, and there is no distinction between correct and incorrect answers. At the same time, it ensures the confidentiality of the survey results and the authenticity and validity of the data filled in. The first part of the demographic information consists of 10 items, mainly aimed at collecting the basic information of the respondents. The purpose is to identify valid samples and invalid samples, and to prepare relevant data for further research in the future. The second part mainly consists of 25 items in the main body of the questionnaire, which are measurement items designed around the independent and dependent variables.

4. Data Collection Methods

According to the research requirements, this study adopts cluster sampling and snowball sampling methods to conduct nonoverlapping and nonrepetitive surveys from various universities in Beijing. Systematic sampling is then conducted from each group to conduct a questionnaire survey among students within the group. The steps of the survey implementation process are: preparing the survey questionnaire (preparation, printing, distribution), and determining the person in charge of distributing the questionnaire





→ training the questionnaire investigators, distributing the questionnaire → conducting the survey within one week, entering and self checking the data → verifying the data and inputting it into the satisfaction calculation program to obtain satisfaction at all levels → conducting comparative analysis based on the obtained data to obtain the final result → tracking and feedback on the improvement plan for satisfaction.

5. Reliability and Validity

This study first conducts validity and reliability analysis on the proposed customer satisfaction model for college student apartments. This involves issues of reliability and validity. We tested the reliability and validity of the questionnaire using methods such as Cronbach's alpha, IOC content validity test, and Exploratory factor analysis for structural validity testing. And prepare to conduct confirmatory factor analysis later to test the construct validity of the concept of customer satisfaction in college student apartments. The customer satisfaction of college student apartments is reflected by perceived quality, which is composed of four quality factors (four dimensions), namely public health (CL), building manager services (SE), maintenance services (MA), and safety management (GU) quality factors. A detailed explanation of the measurement indicators for the customer satisfaction concept in college student apartments. We also calculate and analyze the reliability and validity of the research samples. Validity refers to the ability of measuring tools to accurately measure the true state of things, reflecting the accuracy of data. One of the reliability testing methods used in this study is Cronbach's alpha coefficient testing. Validity can be tested through exploratory factor analysis. When using exploratory factor analysis for structural validity analysis measurement, the KMO value needs to be explained first, and the common standard for KMO value indicators is greater than 0.6. It is necessary to provide a detailed explanation of the number of factors explored, the variance explained by each factor, the total variance explained by each factor, the reliability and effectiveness of the measurement model were first evaluated, then the model was tested and analyzed, and finally, the internal mediating effects of the model were explored.

6. Pilot Test

To ensure the scientific and rigorous nature of the research and to ensure that the questionnaire items are reasonable and semantically expressed clearly, a preliminary questionnaire was designed after a literature review and expert discussion, and a small-scale pre-survey was conducted. In March 2022, the questionnaire will be distributed to 100 students from various departments through face-to-face communication and collected. Finally, this study collected a total of 95 questionnaires and screened them, removing 2 invalid questionnaires to obtain 93 valid ones. The reliability and validity of the questionnaires were verified using statistical methods to prepare for further research. In this study, to ensure the rationality of the questionnaire design, we conducted pilot tests on the questionnaire and made modifications based on feedback to improve its readability and form the final questionnaire.

7. Data Analysis

This article measures the customer satisfaction model of college student apartments and fits its conceptual model using survey and recycling data. Then measure the quality factors in the customer satisfaction model, namely public health, building manager services, maintenance services, safety management, etc., one by one. The method used was validity and reliability testing, and exploratory factor analysis was conducted, and SPSS 26.0 was used as the statistical software. The validity testing of the scale mainly includes the testing of content validity and construct validity. Firstly, content validity is used to test the reliability of the scale design, whether the scale items are expressed clearly, and whether there are language ambiguities and other issues. Secondly, construct validity, used to test whether the structure between questionnaire items is reasonable, is generally tested using exploratory factor analysis.

By collecting and organizing relevant data and clarifying existing academic research results, a solid theoretical foundation is provided for this study. This study referred to previous research scales and optimized them through thorough discussions and analysis by experts and scholars, designing a relatively mature questionnaire scale. The Cronbach's alpha coefficient in reliability analysis was used to test the internal consistency reliability of the scale, and exploratory factor analysis (EFA) was used for validity analysis. Among them, $KMO > 0.700$ and Bartlett's sphericity test were significant (< 0.05), indicating that exploratory factor analysis (EFA) is suitable for use. By using principal component analysis and the





maximum variance method for rotation, the cumulative explained variance is greater than 50%, and the eigenvalues are greater than 1. Based on the load distribution of factors in the component matrix (>0.5), the validity of the questionnaire is determined. Test the research hypothesis through correlation analysis. Data analysis is the foundation of research and the basis for statistical analysis and inference. When applying data analysis, analytical models are often used to make the results more scientific and standardized.

Results

1. This article introduces the concept of standard deviation and establishes a two-dimensional satisfaction model based on customer satisfaction and perceived quality standard deviation. The single dimension is expanded into two dimensions, the first dimension is customer satisfaction (CS), and the second dimension is perceived quality standard deviation (SD), which not only considers the weighted average size of each evaluation item but also characterizes the distribution of each evaluation item from an uncertainty perspective.

2. Proposed the application of a two-dimensional model of customer satisfaction to the study of service and management in college student apartments, clarified the two-dimensional model of customer satisfaction in college student apartments, proposed four basic hypotheses related to the research question, and verified them. This study established a customer satisfaction model for college student apartments, which includes two structural variables: perceived quality and customer satisfaction; Through expert interviews and exploratory factor analysis (calculated using SPSS software), service perceived quality can be divided into four main quality factors, namely public health (CL), chief services (SE), maintenance services (MA), and safety management (GU), and corresponding model parameter indicators are provided; Proposed the definition of perceived quality standard deviation for college student apartments.

3. Through relevant data analysis, it was found that there is no significant negative correlation between student satisfaction and the number of complaints. However, the inconsistency in perceived quality is an important reason for complaints. The difference in perceived quality standards is positively correlated with the number of student complaints, indicating that as students' complaints about service quality increase, it is more likely to trigger complaints. Specific data shows that the correlation coefficients between the quality standard deviation of complaints related to public health, building chief services, maintenance services, safety management, and the number of student complaints are all greater than 0.6, indicating a positive correlation with business trips.

4. This study established a structural equation model for customer satisfaction in college student apartments, summarized the parameter indicators and value judgment conditions of the structural equation model, and organized the research ideas. By providing a detailed introduction to the sample selection and implementation plan, as well as the distribution and collection of questionnaires, over 400 documents were distributed in the 2022-2023 academic year, with a credibility rate of 93%. In terms of questionnaire data processing, four principles for data screening were proposed, corresponding mathematical models were established, and relevant processing programs were written. Please refer to the appendix for details. The data screening rate can reach up to 5%. Through empirical verification, the sample size meets the required scale of the structural equation model and has passed the normality test of single variables.

5. Through empirical data verification, the conceptual model of the four dimensions of customer satisfaction in college student apartments has high validity and reliability. The customer satisfaction model has passed the structural model test, and empirical data statistical analysis shows that public health (CL), building manager services (SE), maintenance services (MA), and safety management (GU) have a positive impact on customer satisfaction (CS). The standardized path coefficients between the four dimensions and customer satisfaction (CS) are 0.23, 0.10, 0.49, and 0.16, respectively.

This article presents data on customer satisfaction and perceived quality standard deviation of college student apartments for the academic year 2022-2023, and conducts a correlation analysis between customer satisfaction, perceived quality standard deviation, and the number of student complaints. The results show that there is no significant negative correlation between customer satisfaction and the number of student complaints in college student apartments, but there is a significant positive correlation between perceived





quality standard deviation and the number of complaints (correlation coefficient greater than 0.6). When the trend of changes in satisfaction and perceived quality standard deviation is inconsistent, the trend of changes in satisfaction and the number of student complaints is inconsistent; When the trend of satisfaction is consistent with the change in perceived quality standard deviation, the trend of satisfaction is consistent with the change in the number of student complaints.

Discussion

This study presents a two-dimensional satisfaction model for assessing customer satisfaction in college student apartments, with customer satisfaction (CS) and perceived quality standard deviation (SD) as the primary dimensions. Unlike traditional one-dimensional models, this approach takes into account both the average customer satisfaction score and the variability in perceived quality, capturing uncertainty in evaluations. According to Chen et al. (2021), using SD as a secondary metric allows for a more in-depth understanding of how consistent or inconsistent perceptions are, resulting in a broader view of customer satisfaction in environments such as college apartments, where services are multifaceted and subject to varying student experiences. This dual consideration of satisfaction and SD results in a more comprehensive framework for managing and improving services.

1. Application of the Two-Dimensional Model in College Student Apartments

The two-dimensional satisfaction model is especially useful for managing college student apartments, where various services such as public health, safety, and maintenance are critical to overall satisfaction. This study demonstrates that student satisfaction can be effectively analyzed by taking into account four quality factors: public health (CL), chief services (SE), maintenance services (MA), and safety management (GU). Zhang et al. (2023) discovered that service quality factors have a significant impact on customer satisfaction in similar settings, confirming that certain structural variables, such as public health and safety, are consistently prioritized in residential facilities. The model's use of SD to evaluate these aspects emphasizes the importance of consistency in meeting students' expectations, making it a valuable tool for apartment managers looking for targeted improvements.

2. Correlation Between Perceived Quality and Student Complaints

With correlation coefficients above 0.6 for topics like public health and maintenance services, the study's data analysis demonstrates a strong positive relationship between student complaints and perceived quality standard deviation. This result implies that more complaints are linked to greater variability in the perception of service quality. Similar research by Liu and Wang (2022) supports this conclusion by showing that perceived quality inconsistencies are a major source of customer complaints and dissatisfaction. Therefore, upholding uniform service standards is essential for handling complaints and improving satisfaction, especially in dorms for college students, where inconsistencies frequently cause students' expectations for quality to be unmet.

3. Structural Equation Model and Data Validation

A structural equation model (SEM) was created to examine the connections between quality factors and customer satisfaction to further validate the two-dimensional satisfaction model. The study can estimate the effect of individual quality factors on overall satisfaction by using SEM, and empirical testing demonstrates the validity and reliability of the model. The path coefficients, which ranged from 0.10 to 0.49, showed that the four structural variables—CL, SE, MA, and GU—had positive relationships with CS. The usefulness of SEM in satisfaction research was supported by a related study by Nguyen et al. (2022), which used SEM to evaluate customer satisfaction in residential settings and also noted the beneficial effects of safety and maintenance on satisfaction.

4. Data Collection, Screening, and Sample Integrity

A representative sample size was guaranteed by the study's thorough data collection procedure, which included more than 400 distributed surveys with a 93% credibility rate. The integrity of the dataset was maintained by achieving a screening rate of up to 5% through methodical data processing and screening procedures, including mathematical models for data management. Martinez and Ruiz (2020) point out that effective data management is crucial to getting accurate results in satisfaction studies, particularly in large-scale surveys. Because it reduced data inconsistencies that could skew model outputs, this meticulous approach to data preparation further enhanced the empirical validation of the satisfaction model.

The study offers a useful framework for comprehending customer satisfaction in apartments for college





students, emphasizing the significance of perceived quality variability as well as satisfaction levels. Consistency in service delivery is essential to lowering dissatisfaction, as evidenced by the positive correlation between complaints and perceived quality standard deviation. Because of the model's efficacy, it can be used in service-oriented environments where customer satisfaction depends on consistency, such as college apartments. Building on this foundation, future studies can investigate interventions that target perceived quality variability specifically to improve overall satisfaction across a range of residential facilities.

Implication and Contribution

The innovation of this study lies in the following three aspects:

1. We introduced the standard deviation of perceived quality into the study of customer satisfaction theory and established a two-dimensional model of customer satisfaction. The two-dimensional model of customer satisfaction proposed in this paper includes two dimensions: customer satisfaction (CS) and perceived quality standard deviation (SD). The concept of standard deviation is introduced into customer satisfaction evaluation, and a mathematical model is established. The single indicator is extended to two indicators, which not only consider the weighted average value of each evaluation item but also characterize its distribution. It more comprehensively and accurately characterizes the degree to which customers need to be satisfied, enriching the theoretical research of customer satisfaction.

2. We have established an empirical model for customer satisfaction, the two-dimensional model of customer satisfaction for college student apartments, and directly applied it to the management and service work of college student apartments. Based on the characteristics of college student apartments and students, a customer satisfaction model for college student apartments was established. Through exploratory factor analysis, perceived quality can be divided into four quality factors, namely public health (CL), building chief services (SE), maintenance services (MA), and safety management (GU). The model passed validity and reliability tests and provided the standard deviation and mathematical model for the perceived quality of college student apartments.

3. Conduct a large-scale evaluation of students' satisfaction with school apartments. Customer satisfaction evaluation is generally an evaluation of a certain time section of the same object, and this article conducted a large-scale survey of the same type of service object to conduct in-depth research on satisfaction. This article proposes principles for large-scale questionnaire data screening, including the accuracy principle, repeatability principle, null item principle, and identity response principle, and establishes corresponding mathematical models to verify the effectiveness of questionnaire screening methods, which is currently rare in customer satisfaction research.

Recommendation for Future Research

Expand the scope of research.

Geographical extension: Future research should expand its geographical scope to cover universities in more regions, especially those in different provinces and cities.

International comparison: It is recommended to divide the research scope into international universities and conduct cross-cultural comparative studies. This can not only verify the universality of our research model but also draw on successful experiences from other countries and regions.

Combining psychology and behavioral science: Forming a questionnaire survey using the theories and methods of psychology and behavioral science to explore students' psychological and behavioral responses in different contexts. This helps to have a more comprehensive understanding of the questionnaire survey mechanism for students.

Increasing sample diversity

Sample diversity: Future research should increase sample diversity, covering students of different levels, majors, genders, and economic backgrounds, especially focusing on the needs and satisfaction of specific groups such as international students and students from developing countries.

Sample size expansion: Future research should increase the sample size to improve the reliability and accuracy of research results. Large sample data can better reflect the overall situation, reduce pollutants,





and provide more accurate analysis results.

Long-term research

Long-term follow-up research: It is recommended to conduct long-term follow-up research to observe the changing trends of student satisfaction between different semesters or years.

Behavioral change research: Through longitudinal research, the relationship between student behavior and questionnaire surveys can be analyzed, such as the impact of length of stay on questionnaire surveys, changes in questionnaire surveys after relocation, etc.

Technology and Innovation Applications

Big data and artificial intelligence: Future research can utilize big data and artificial intelligence technologies to conduct more accurate and real-time questionnaire survey analysis. Real-time monitoring of students' feedback on apartment services through social media data analysis.

Standardized Management System: Research the application of standardized management systems in apartment services, such as intelligent maintenance reporting systems, intelligent safety management systems, etc. This helps to improve service efficiency and quality and enhance student satisfaction.

Finally, it is hoped that through these suggestions for future research, the satisfaction evaluation model can be further optimized. And deepen the understanding of consumer satisfaction in college student apartments, continuously improve the apartment management level, and provide students with a better living experience.

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