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Research on the construction of a service quality evaluation system for university student dormitories based on the Delphi method

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Student dormitories play a pivotal role in the daily lives of university students in China, significantly influencing their academic, residential, and developmental experiences. However, there is a lack of a standardized framework to evaluate the service quality of these dormitories. This study aimed to develop a customized service quality evaluation index system specifically for Chinese university dormitories. The Delphi method and Analytic Hierarchy Process (AHP) were employed, involving 15 experts from Chinese universities. Two rounds of expert deliberation were conducted, starting with 28 initial indicators. The expert consultations resulted in the identification of six primary and 23 secondary indicators that form the service quality evaluation system. This framework is tailored to the specific needs of Chinese university dormitories and provides a solid technical foundation for future evaluations. It is expected to contribute to the improvement of dormitory management practices across China.

KEYWORDS

Delphi method, university student dormitories, index system, service quality, evaluation

1 Introduction

Extensive research on service quality began in the 1980s, with international researchers conducting numerous studies on its dimensions. Service quality is typically, defined by comparing service outcomes to established standards or assessing the gap between service perception and expectation (Levitt, 1972). Domestic scholars have researched the service quality of university student apartments, focusing on aspects such as service content and characteristics, bright apartment construction, and ideological and political education.

Research has shown that improving service quality can effectively enhance student satisfaction, particularly in optimizing service content and characteristics, where the effect is more pronounced (Li, 2020). Studies on smart dormitories have found that intelligent management significantly improves the quality of dormitory services, enhances students' living experiences, and increases management efficiency (Chen, 2023). Additionally, the construction of dormitory culture holds significant importance in ideological and political education, playing a vital role in developing students' thinking and value formation (Li, 2024a,b). The service quality of university dormitories can be divided into "hard" services and "soft" services. "Hard" services refer to various hardware facilities within the dormitory, such as beds, desks, chairs, lighting, intelligent laundry equipment, air conditioning, and other amenities that directly impact students' daily living quality (Lu and Lin, 2016). On the other hand, "soft" services

include institutional construction and management mechanisms, such as dormitory culture development, ideological and political education functions, standardized management systems, and fire safety management. These aspects are highly beneficial for students' holistic development and healthy growth (Feng et al., 2018; Luo, 2012; Liu, 2000; Wei and Liu, 2013; Pang, 2021). Whether it is the "hard" services or the "soft" services of student apartments, both aim to create a comfortable, safe, and warm living and learning environment from the perspective of benefiting students' lives and promoting their healthy growth to meet the needs of resident students to the greatest extent.

The previous research on the quality of service in university dormitories has provided valuable insights for this study. However, these studies have yet to systematically discuss the evaluation criteria for service quality, focusing on the connotations and characteristics of service quality, thereby offering limited guidance for the subsequent enhancement and improvement of service quality. Therefore, this study constructs a systematic and comprehensive service quality evaluation index system. First, it covers all university dormitory service quality aspects, including tangibility, reliability, responsiveness, assurance, empathy, and educational effectiveness. It provides dormitory managers with a complete evaluation framework to comprehensively assess and improve service quality. Second, by using the Delphi method and the Analytic Hierarchy Process (AHP) to determine each index's weight, the evaluation system's objectivity and accuracy are enhanced, making the evaluation results more scientific and reliable, genuinely reflecting the current status of dormitory service quality.

Furthermore, during the expert consultation process, the index system was optimized to improve its operability, making it easy to apply in actual management and helping managers evaluate and improve service quality more effectively. Finally, a dynamic adjustment mechanism for the evaluation indices is proposed to ensure that the index system can be continuously updated and optimized in response to changes in student needs and the social environment, maintaining its applicability and foresight. This study not only addresses the deficiencies in systematic and guiding aspects of existing research but also provides a scientific and highly operational service quality evaluation tool for university dormitory management, aiding managers in comprehensively assessing and improving dormitory service quality, promoting the overall development of students, and enhancing the level of dormitory management.

2 Literature review

2.1 Service quality

Extensive research on service quality began in the 1980s, with international researchers investigating various dimensions of its definition. Service quality is primarily defined by comparing service outcomes to service standards or the gap between perceived and expected service (Levitt, 1972). In terms of service quality content, it should include the method of service delivery and derive characteristics that affect service quality, such as intangibility, perishability, and the degree of customer participation (Sasser et al., 1978). From the consumer's perspective, service quality is the personal experience gained during the service consumption process, precisely the gap between expectations before receiving the service and the actual service received. Service quality is seen as the result of the consumer's evaluation of the service process, in

which they compare their expectations with the actual service received, considering the judgment of service quality to reflect the degree of difference between the consumer's perceptions and expectations (Gronroos, 1984; Parasuraman et al., 1988). In the study of the connotation of service quality, scholars have reached a consensus: the customer should be considered the sole evaluator of service quality, which possesses essential characteristics such as subjectivity, interactivity, and process orientation.

2.2 Research on customer perceived service quality models

The pivotal moment in the development of customer-perceived service quality models can be pinpointed to the early 1980s, a time when the service industry first began to underscore the significance of customer satisfaction and service quality. This era marks the genesis of our exploration into the development stages of these models (Shang, 2012).

2.2.1 First stage

The customer-perceived service model, introduced by Finnish scholar Gronroos in 1983, places the customer at the heart of the service process. This model underscores customers' subjective perception and evaluation of service, viewing the interaction between the service provider and the service recipient as pivotal. It delves into understanding customers' needs, expectations, and how they perceive and evaluate the services they receive, thereby highlighting customers' subjective cognition and feelings regarding service quality.

2.2.2 Second stage

The PZB service quality model, abbreviated as PZB, was first published in 1985 by American scholars A. Parasuraman, Valarie A. Zeithaml, and Leonard L. Berry. This model defines service quality as the gap between customers' expectations and perceptions of the service received. The PZB model emphasizes that service providers must pay attention to and understand customers' expectations and strive to deliver experiences that exceed these expectations during the service process, thereby improving service quality and customer satisfaction.

2.2.3 Third stage

Parasuraman, Zeithaml, and Berry proposed the SERVQUAL model, developed based on the PZB model, in 1988. It is a tool for measuring service quality by comparing customers' expectations with their actual perceptions to evaluate service providers' performance. The SERVQUAL model covers five dimensions: tangibility, reliability, responsiveness, assurance, and empathy, which are used to assess service quality and guide improvement measures.

2.2.4 Fourth stage

As research progressed, scholars expanded and revised the customer-perceived service quality model to suit different industries and cultural backgrounds, proposing various dimensions and indicators. These extended models allow for more personalized and targeted service quality evaluations. Based on the original five dimensions of the SERVQUAL model, this paper introduces an additional dimension of "Educational Character" tailored to the characteristics of university student dormitories. This new dimension allows for a more comprehensive evaluation and improvement of

service quality in university student dormitories, focusing not only on the daily life needs of students but also on promoting their overall development and enhancement of their comprehensive qualities.

2.3 University student dormitories

University dormitories are an essential part of college life, providing students with a safe, comfortable, and convenient living environment and playing multiple roles in their growth and development (Lu and Lin, 2016). The functions of university dormitories go beyond essential daily life support, such as maintaining hygiene, managing facilities, and ensuring safety. They also offer a variety of service facilities that meet students' academic and daily needs. For instance, study rooms, internet services, and convenient living facilities are all critical components in providing a conducive environment for both learning and living. Moreover, student dormitories play a crucial role in cultivating students. By offering an independent living environment, organizing cultural activities within the dormitory, and providing safety education, dormitories help students improve their self-management skills and enhance their cultural literacy and social abilities. Therefore, university dormitories are essential for ensuring student life and serve as a vital space that supports the holistic development of students, taking on the critical task of aiding their growth and cultivating their comprehensive qualities.

2.4 Delphi method and analytic hierarchy process

The Delphi method, also known as the expert opinion method, was proposed by the RAND Corporation in the 1950s. The Delphi method gathers expert opinions through a systematic process, where experts are not allowed to discuss or directly communicate with each other. Instead, they interact with the researchers by filling out questionnaires. A consensus or divergence of opinions among the experts gradually emerges through repeated rounds of questionnaires. The Analytic Hierarchy Process (AHP), introduced by Thomas L. Saaty in the 1970s, is a decision-making method that breaks down complex problems into different levels and criteria. These criteria are then compared in pairs, and weights are assigned to each.

Both the Delphi method and AHP have found practical applications in fields such as educational research, public administration, and service quality evaluation. In educational research, these methods are often employed to construct curriculum evaluation systems. Experts, through multiple rounds of feedback, use AHP to select key indicators that affect teaching quality and determine their relative importance, making the evaluation system more scientific and comprehensive (Cha et al., 2023). In the field of public administration, the Delphi method and AHP are frequently used for policymaking and planning. For example, in urban development planning, experts provide reasonable suggestions through several rounds of feedback and AHP, optimizing weight distribution to help formulate more rational development strategies (Chen, 2020). In service industries such as hotel management and healthcare services, experts assess the importance of different service components and use AHP to calculate the weights, thereby optimizing service processes and improving customer satisfaction (Yin et al., 2024).

3 Preliminary construction of the index system

The quality evaluation index system for university student dormitory services, hereinafter referred to as the "index system," is not a hasty creation. It, is based on the group standard "Regulations for Management and Service of University Student Dormitories" (T/JYHQ 0003–2019) issued by the China Association of Higher Education Logistics in 2019. Our process involved searching and analyzing relevant domestic literature in databases such as CNKI and Wanfang, combining the characteristics of university student dormitory management, and conducting interviews with students. This comprehensive approach led us to adjust the SERVQUAL model. Based on the original five dimensions—tangibility, reliability, responsiveness, assurance, and empathy—we added the "educational function" dimension. We have preliminarily drafted six primary indicators and 28 secondary indicators (see Table 1).

This adjustment is because university student dormitories are not just places providing accommodation but also essential venues for ideological and political education. The educational function of dormitories can help students shape good character and values through dormitory culture and regulations, promote holistic development, and enhance their self-management abilities through various cultural activities. By adding the "educational function" dimension, the evaluation index system can more comprehensively reflect the overall service quality of university dormitories and better meet students' learning and living needs.

The study selects tangibility, reliability, responsiveness, assurance, empathy, and educational value as the six core dimensions of the university dormitory service quality evaluation system based on the following considerations:

1. Tangibility: The tangibility dimension primarily focuses on the modernization and attractiveness of the dormitory's physical facilities and equipment, which are the most direct aspects through which students perceive service quality. Modern facilities enhance students' quality of life and increase their overall satisfaction with the dormitory environment.
2. Reliability: This dimension emphasizes the stability and consistency of services, ensuring that students consistently receive high-quality services daily. Reliability is essential for building students' trust and dependence on dormitory services.
3. Responsiveness: The responsiveness dimension assesses the speed and attitude with which service staff respond to students' needs. It is not just a key factor but a critical one in improving student satisfaction. A quick and positive response can significantly enhance the student experience.
4. Assurance: Assurance involves the professional competence of service staff and the safety they provide during the service process. It ensures the safety and reliability of the service, thereby enhancing students' trust in dormitory services.
5. Empathy: Empathy emphasizes the service staff's understanding and care for students' needs and emotions, reflecting the humanization of services. This dimension helps to strengthen students' sense of belonging and satisfaction with dormitory services.

TABLE 1 Service quality index system for university student apartments.

Dimension	Number	Relevant indicators (secondary indicators)	Source
A Tangibility	A1	Apartment facilities and equipment are modern	Zhang (2020), Xu (2012), Gao (2009), and Liu (2015)
	A2	Basic apartment facilities can meet students' accommodation needs	Zhang (2020), Zhao (2006), Xu (2012), Zhou (2017), Liu (2015), and Gao (2009)
	A3	Apartment facilities and equipment are attractive	Zhang (2020), Xu (2012), and Zhou (2017)
	A4	Apartment management and service personnel are neatly dressed and wear uniforms	Zhang (2020), Zhao (2006), Xu (2012), Zhou (2017), Peng (2022) and Liu (2015)
	A5	There are specific manuals for regulations and facilities use upon check-in	Liu (2015) and Peng (2022)
	A6	Apartment facilities and equipment match the provided services	Zhang (2020) and Zhao (2006)
B Reliability	B1	Apartment service personnel can promptly provide and fulfill commitments	Zhang (2020), Zhao (2006), Xu (2012), Zhou (2017), and Liu (2015)
	B2	Apartment service personnel can promptly help students solve problems	Zhang (2020), Zhao (2006), Xu (2012), and Zhou (2017)
	B3	Apartment service personnel promptly clean to maintain a tidy living environment	Zhang (2020), Xu (2012), Zhou (2017), Gao (2009), and Liu (2015)
	B4	Water and electricity supply and building maintenance are well-maintained	Zhang (2020), Xu (2012), Zhou (2017), and Liu (2015)
	B5	Apartment facilities are repaired in a timely manner	Liu (2015), Peng (2022)
	B6	Apartment service personnel can help students solve accommodation problems	Zhou (2017) and Liu (2015)
C Responsiveness	C1	Apartment service personnel can promptly provide services to students	Zhang (2020), Zhao (2006), and Xu (2012)
	C2	Apartment service personnel are always willing to help students	Zhang (2020), Zhao (2006), Xu (2012), Zhou (2017), and Zhong (2009)
	C3	Apartment service personnel inform students of the exact service time	Zhang (2020), Zhao (2006), and Xu (2012)
	C4	Apartment service personnel can promptly issue various service notices	Zhou (2017) and Liu (2015)
D Assurance	D1	Apartment service personnel are trustworthy	Zhang (2020), Xu (2012), Zhou (2017), Gao (2009), and Liu (2015)
	D2	Apartment service personnel are friendly when providing services	Zhang (2020), Xu (2012), Zhou (2017), and Gao (2009)
	D3	Apartment service personnel have sufficient knowledge to address students' issues	Xu (2012), Zhou (2017), Gao (2009), and Liu (2015)
	D4	Apartment service personnel can provide good security and order maintenance services	Zhang (2020) and Xu (2012)
E Empathy	E1	Apartment service personnel can provide personalized and special services, such as sewing and package collection	Zhang (2020), Zhao (2006), Xu (2012), Zhou (2017), and Liu (2015)
	E2	Apartment service personnel prioritize students' interests	Zhao (2006), Xu (2012), and Zhou (2017)
	E3	Apartment service personnel can promptly understand students' demands	Zhao (2006), Xu (2012), and Zhou (2017)
	E4	Apartment service personnel provide services at times that meet students' needs	Zhang (2020), Xu (2012), Zhou (2017), and Liu (2015)
F Educative	F1	Apartment service personnel educate students to cultivate self-management awareness	Xie (2021), Pang et al. (2021), and Gu (2022)
	F2	Cultural activities in the apartment are attractive	Xie (2021), Pang et al. (2021), and Chang et al. (2021)
	F3	Ideological and political counselors reside in apartments and engage in students' lives	Li (2024a,b), Ma (2011), and Huang (2009)
	F4	Apartment management personnel regularly conduct safety knowledge education	Xie (2021), Pang et al. (2021), Li (2024a,b), and Chang et al. (2021)

6 Educational value: The educational value dimension, added in this study to the original SERVQUAL model, acknowledges that university dormitories are not just places of residence but also essential sites for ideological and political education. The educational function of dormitories can help shape students' moral character and values through dormitory culture and regulations, promote their holistic development through various cultural activities, and enhance their self-management abilities. Incorporating the educational value dimension allows the evaluation system to reflect the overall quality of dormitory services more comprehensively, better meeting students' academic and living needs.

4 Research methods

4.1 Delphi method

In constructing the service quality evaluation system for university dormitories, the Delphi method was employed to integrate and optimize the initially selected evaluation indicators. In this study, from March 2–16, 2024, a large amount of relevant literature was reviewed and analyzed, and 28 preliminary evaluation indicators related to the service quality of university dormitories were identified. The "Expert Consultation Form on the Evaluation of University Dormitory Service Quality" was developed based on these initial indicators. Subsequently, from March 20 to April 5, 2024, 15 experts from 8 universities in Hangzhou were invited to participate in the first round of Delphi consultation. These experts included seven university logistics management personnel, five dormitory management leaders, and three scholars in educational administration, all with extensive experience and professional backgrounds. The 15 experts independently evaluated the 28 indicators and provided feedback through a questionnaire. Based on the feedback from the experts, the questionnaire indicators were revised and optimized. Following this, from April 15 to May 7,

2024, the second round of Delphi consultation was conducted, inviting the same 15 experts to reevaluate the revised indicators, gradually reaching a consensus. Through the two Delphi consultations, a service quality evaluation system for university dormitories was finalized, consisting of 6 primary and 23 secondary indicators.

4.2 Statistical methods

The reliability and efficiency of the statistical methods used in this study were ensured by the use of Excel 2020 software for data entry and calculation. This software was instrumental in determining expert participation coefficients, expert authority levels, variation coefficients, and full score rates. Expert authority was expressed by the expert authority coefficient (Cr), which is composed of two factors: the basis for expert judgment (Ca) and the expert's familiarity with the topic (Cs). The calculation formula is $Cr = (Ca + Cs)/2$. A higher Cr value indicates a higher degree of expert authority. Expert enthusiasm was represented by the questionnaire recovery rate, with a higher recovery rate indicating a higher degree of enthusiasm (Dai, 2014; Zhao, 2017).

SPSS 27.0 software, known for its precision and accuracy, was used to calculate the mean importance values, standard deviations, and Kendall's coordination coefficients. The degree of agreement among expert opinions was represented by Kendall's W, which ranges from 0 to 1. A higher W indicates better coordination. The importance of the indicators was assessed using the Likert 5-point scale, with values ranging from 5 (very important) to 1 (very unimportant) (Tables 2–4).

5 Research process and analysis

5.1 Analysis of expert information

In constructing the evaluation system for the service quality of student dormitories in higher education institutions, this study combined representativeness with authority, establishing detailed

TABLE 2 Familiarity ratings for evaluation indicators.

Familiarity level	Very familiar	Quite familiar	Generally familiar	Slightly familiar	Not familiar
Quantitative value	0.9	0.7	0.5	0.3	0.1

TABLE 3 Importance ratings for evaluation indicators.

Importance level	Very important	Quite important	Generally important	Slightly important	Not important
Quantitative value	5	4	3	2	1

TABLE 4 Quantitative table of expert judgment basis and impact degree.

Judgment basis	Impact degree on judgment		
	Large	Medium	Small
Theoretical analysis	0.3	0.2	0.1
Practical basis	0.5	0.4	0.3
Domestic and foreign references	0.1	0.1	0.1
Subjective judgment	0.1	0.1	0.1

criteria for selecting experts. These criteria included work duration, work experience, and actual contributions to managing student dormitories in higher education institutions. As a result, the study invited 15 experts from the logistics management field of eight universities, including China Jiliang University, Zhejiang Sci-Tech University, Zhejiang University of Media and Communications, and Zhejiang Normal University, to participate in the consultation. These experts possess extensive experience and professional knowledge in managing student dormitories, most of whom are over 36 years old and have worked in higher education logistics management for over 10 years. Some of the experts hold leadership positions in logistics departments and are responsible for the daily management of student dormitories, bringing a wealth of practical experience and managerial expertise. Their participation provided valuable feedback and guidance in optimizing the indicator settings for this study. The response rate for the consultation questionnaires was 100%, reflecting the experts' active involvement. Additionally, the experts' authority coefficient (Cr) was 0.875 in the first round and 0.89 in the second round, indicating a high level of authority among the participating experts (Table 5).

5.2 Degree of expert opinion concentration and coordination

Based on the feedback after the first round of expert consultation, five secondary indicators were deleted or merged, and five secondary indicators were modified and optimized. The mean importance values for primary indicators ranged from 4.47 to 4.93, with standard deviations from 0.258 to 0.640 and variation coefficients from 0.052 to 0.143. The mean values were all greater than 4, the standard

deviations were all less than 1, and the variation coefficients were all less than 0.20, indicating little disagreement among the experts on the primary indicators, and their opinions were relatively consistent. The mean importance values for secondary indicators ranged from 3.53 to 4.93, with standard deviations from 0.258 to 1.642 and variation coefficients from 0.072 to 0.465. Among these, one indicator had a mean value less than 4, four indicators had standard deviations greater than 1, and three indicators had variation coefficients greater than 0.25, indicating significant disagreement among experts on these indicators, necessitating some adjustments.

The degree of agreement among expert opinions is represented by Kendall's W, which ranges from 0 to 1. A more giant W indicates better coordination. The W value for the first round of expert consultation was 0.191 ($p < 0.023$). The coordination degree significantly improved in the second round, with a W value of 0.410 ($p < 0.001$), indicating that expert consultation could be concluded. Details are provided in Table 6.

5.3 Indicator selection and weighting

This study first constructed a hierarchical model of the index system and developed a judgment matrix. The weights of the six primary and twenty-three secondary indicators were calculated using the Analytic Hierarchy Process (AHP) method in the SPSSAU system. The consistency check results showed CR < 0.1 and CI = 0, indicating the check was passed. The final evaluation index system for university student apartment service quality and the weights of each indicator are shown in Table 7.

The table above shows that various dimensions and indicators in the service quality evaluation system for student dormitories in

TABLE 5 General information of consultation experts ($n = 15$).

Item	Group	Frequency (persons)	Composition ratio (%)
Age (years)	26–35	3	20
	36–45	8	53
	46–55	4	27
Years of work	1–10	3	20
	11–20	7	47
	21–30	5	33
Education level	Bachelor's	10	67
	Master's	5	33

TABLE 6 Degree of expert opinion concentration and coordination.

Indicator level	Importance value	Coordination coefficient
	Mean	SD
First round		
Primary indicators	4.47–4.93	0.258–0.640
Secondary indicators	3.53–4.93	0.258–1.642
Second round		
Primary indicators	4.67–4.93	0.258–0.488
Secondary indicators	4.27–4.87	0.352–0.617

TABLE 7 University student apartment service quality evaluation index system.

Primary indicator	Primary indicator weight	Secondary indicator	Secondary indicator weight
A Tangibility	16.628%	A1 Modern and attractive facilities and equipment	4.060%
		A2 Basic facilities meeting students' accommodation needs	4.497%
		A3 Neatly dressed management and service personnel	4.060%
		A4 Manual for regulations and facility use at check-in	4.372%
B Reliability	17.090%	B1 Timely provision and fulfillment of commitments by service personnel	4.560%
		B2 Timely assistance in solving student problems	4.560%
		B3 Regular cleaning to maintain a tidy environment	4.497%
		B4 Well-maintained water, electricity, and building	4.435%
		B5 Timely repair of facilities	4.560%
C Responsiveness	16.859%	C1 Prompt service provision by service personnel	4.497%
		C2 Willingness to help students	4.185%
		C3 Timely issuance of various service notices	4.247%
D Assurance	16.859%	D1 Trustworthiness of service personnel	4.497%
		D2 Friendliness of service personnel	4.560%
		D3 Professional knowledge of service personnel	4.247%
		D4 Good security and order maintenance services	4.372%
E Empathy	16.397%	E1 Personalized and special services (e.g., Sewing)	4.060%
		E2 Efforts to meet reasonable student requests	4.185%
		E3 Timely understanding of student demands	4.122%
F Educative	16.166%	F1 Education for cultivating self-management awareness	4.435%
		F2 Attractive cultural activities	3.998%
		F3 Residence of ideological and political counselors	4.435%
		F4 Regular safety knowledge education	4.560%

higher education institutions differ. The higher the weight, the greater the influence of that indicator on the overall service quality evaluation. By analyzing the weight data, the following conclusions can be drawn:

First, among the six dimensions of the evaluation system, "Reliability" has the highest weight, indicating that it has the most significant impact on service quality and is particularly important. "Responsiveness" and "Assurance" followed, suggesting that timely responses to student needs and reliable services play a crucial role in dormitory management. "Tangibility" ranks third, reflecting that the condition of hardware facilities significantly impacts students' living experiences. "Empathy" ranks fourth, with a lower weight, but humane services still improve student satisfaction. "Educational Function" ranks last, occupying the lowest weight, but it plays an irreplaceable role in cultivating students' overall qualities and should not be neglected in dormitory management.

Dormitory managers should allocate resources appropriately based on the importance of these dimensions:

1 Improved reliability, responsiveness, and assurance should be prioritized to ensure that students' primary living conditions and safety are adequately secured.
2 Efforts should be made to gradually enhance "Tangibility" and "Empathy" by improving hardware facilities and strengthening humane services to increase student satisfaction.

3 If resources allow, efforts should be directed toward gradually strengthening the "Educational Function" to support the comprehensive development of students.

Second, looking specifically at the individual indicators in the evaluation system, B1, B2, B5, D2, F4, A2, B3, C1, and D1 carry the highest weights, all above 4.497%. These directly affect students' basic living conditions and safety, making them crucial components of dormitory management services. Indicators such as A4, B4, D4, F1, F3, D3, and C3 have medium weights. Although they do not directly influence students' daily lives as much as the former indicators, they significantly improve the overall quality of dormitory management services. Indicators A1, A3, E1, E2, E3, C2, and F2 have lower weights, but they positively enhance the dormitory's overall image and increase student satisfaction.

When resources are limited, dormitory managers should allocate resources based on the weight of each indicator. Priority should be given to improving key indicators such as B1, B2, B5, D2, F4, A2, B3, C1, and D1, directly impacting students' living conditions and safety, which ensures that students' basic needs are met, such as timely maintenance of dormitory facilities and improving the response speed of service personnel. Next, indicators with medium weights—A4, B4, D4, F1, F3, D3, and C3—can be gradually optimized. Improving these indicators can further enhance overall service quality and increase student satisfaction with dormitory services. For example, they are

improving the communication of dormitory regulations, providing better instructions for facility use, or organizing more cultural activities within the dormitory. Lastly, if sufficient resources are available, further improvements can be made to indicators with lower weights, such as A1, A3, E1, E2, E3, C2, and F2. These indicators are significant for enhancing the overall image of the dormitory and addressing students' personalized needs, such as improving hardware facilities and offering more personalized services. Through gradual optimization, the overall service level of the dormitory and student satisfaction will steadily improve.

6 Conclusion and discussion

This paper is based on the five original dimensions of the SERVQUAL model—tangibles, reliability, responsiveness, assurance, and empathy. Combined with the characteristics of university dormitory management, which emphasizes the holistic development and education of students, a new dimension, "educational effectiveness," has been added to construct a six-dimensional service quality evaluation framework. The five dimensions of the SERVQUAL model—tangibles, reliability, responsiveness, assurance, and empathy—comprehensively reflect the basic service quality of student dormitories. These dimensions include the hardware facilities of the dormitory, the reliability and responsiveness of the service staff, the assurance during the service process, and the care and understanding of the service staff for the students' needs. The educational effectiveness dimension, a significant addition, further expands the connotation of service quality, extending the function of student dormitories from mere accommodation to encompass education and culture, aligning with the comprehensive requirements of modern university education.

The newly added dimension of educational effectiveness enhances students' comprehensive quality and holistic development by cultivating self-management awareness, organizing engaging cultural activities, stationing ideological and political counselors, and providing regular safety education.

Specifically, university students are at a critical stage of shaping their personalities and self-management abilities. Cultivating students' self-management awareness helps them develop good habits and self-discipline. Through the guidance of dormitory management personnel and related activities, such as organizing self-management skills training and experience-sharing sessions within the dormitory, students can better master self-management skills. Additionally, cultural activities in dormitories are an essential part of student life. These activities alleviate academic pressure and enrich students' extracurricular lives, enhancing their sense of belonging and well-being. Regularly hosting cultural festivals and traditional holiday celebrations encourages active student participation and improves social skills.

Similarly, ideological, and political education is crucial to university students' growth. Universities can promptly understand and address students' ideological concerns by stationing ideological and political counselors in dormitories. Counselors can regularly visit dormitories, communicate with students, understand their thoughts and needs, and provide targeted assistance and guidance. Finally, safety is a fundamental guarantee for students' campus life. Regular safety education, for example, organizing fire prevention, anti-theft, and anti-fraud lectures and drills, can enhance students' safety awareness and ability to respond to emergencies. The four indicators

of educational effectiveness focus on improving students' quality of life and emphasize enhancing their comprehensive qualities. This approach can more comprehensively meet the integrated requirements of modern university education (Zha et al., 2023).

To validate and refine the six dimensions of tangibles, reliability, responsiveness, assurance, empathy, and educational effectiveness, we conducted two Delphi expert consultations to revise and meticulously optimize the initial indicator system. During these consultations, experts provided valuable feedback and suggestions on the initial indicators, based on which we modified and improved the indicator system. We established six dimensions and their corresponding detailed indicators. The constructed service quality indicator system for university student dormitories provides scientific reference and guidance for dormitory management. It enables dormitory managers to comprehensively and systematically assess the current service quality, identify existing problems and deficiencies, and implement targeted improvement measures. This transparent indicator system helps enhance service levels and meet students' diverse needs. Consequently, it further promotes the development of university student dormitories toward higher quality standards (Lu and Lin, 2016).

However, while this paper presents a relatively comprehensive service quality evaluation framework for university student dormitories, the evaluation indicators must be continuously updated and optimized toto respond to evolving student needs and changes in the social environments. Students' needs and expectations evolve with societal development and personal growth. For instance, with technological advancements, students increasingly demand better network facilities in dormitories; with growing environmental awareness, students may become more concerned about green and sustainable practices within dormitories. Therefore, the evaluation indicator system must be flexible, capable of adjustment and optimization based on actual conditions. This adaptability is crucial for the system to remain relevant and effective. Specifically, regular needs assessments and satisfaction surveys can be conducted to understand the latest student needs and expectations, and the evaluation indicators can be adjusted accordingly.

This study introduces an important innovation by adding the "Educational Function" dimension to the traditional five dimensions of the SERVQUAL model. The traditional five dimensions—Tangibility, Reliability, Responsiveness, Assurance, and Empathy—primarily focus on the hardware facilities and service quality of dormitories but pay relatively little attention to the role dormitories play in students' personal development. By incorporating the "Educational Function" dimension, this study provides a more comprehensive reflection of dormitories as spaces for student living and as essential venues for ideological guidance and personal growth. This addition makes the evaluation system more holistic. It enables university administrators to understand dormitories' role in cultivating students' overall qualities better, allowing for more targeted service adjustments.

Additionally, this study conducted two rounds of expert consultation using the Delphi method to validate and adjust the dimensions and specific indicators of the evaluation system, ensuring that it is both scientifically grounded and applicable. By incorporating the "Educational Function" dimension, the evaluation system can assess not only dormitory facilities and service quality but also the dormitory's actual role in supporting student self-management, ideological guidance, and cultural development. This dimension, with its practical applicability, can help dormitory managers understand the real impact of cultural activities on student growth. Naturally, as

the needs for dormitory management in universities evolve, this evaluation system will require continuous adjustment and refinement in practice to better address future diverse demands.

7 Limitations and shortcomings of the study

This study explores the construction of an evaluation index system, which has significant theoretical and practical value. However, the research has several limitations and shortcomings.

First, the diverse types and management themes of university student apartments necessitate a collaborative approach to evaluation. While this study has established an evaluation index system, it requires the collective assessment, analysis, and validation of experts and stakeholders across different types and characteristics of university student apartments. This inclusive process ensures the scientific rigor, dynamism, and operability of the evaluation indicators.

Second, due to the unique nature of the university student apartment sector, most experts participating in this study are experienced in practical work but may need more comprehensive theoretical knowledge. Moreover, the index system for university student apartments involves apartment staff, students, teachers, and other stakeholders. Therefore, the index system may only partially capture the needs and concerns of some parties involved.

Third, as student needs become increasingly diverse and school infrastructure continuously evolves, the index system for university student apartments must be flexible and adjustable. This adaptability is essential to meet changing demands and developments. Regular evaluations and updates will ensure the index system remains current and relevant.

By addressing these limitations and shortcomings, future research can further refine and enhance the evaluation index system. This ongoing process of improvement is crucial to ensure the index system remains responsive to the evolving needs of university student apartments and their stakeholders.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/ participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

CaZ: Conceptualization, Methodology, Project administration, Writing – original draft, Writing – review & editing, Data curation, Formal analysis, Investigation, Software. ChZ: Writing – original draft, Writing – review & editing, Conceptualization, Funding acquisition.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Chang, C. C., Shang, Q. X., Tao, T., et al. (2021). Analysis of the educating path in university student apartments from the perspective of "three comprehensive educations". *Sci. Technol. Inform.* 19, 115–118.

Cha, G. Q., Xu, Y. N., and Xu, W. J. (2023). Evaluation indicators and methods for university safety education systems from a broad security perspective. *China Safety Sci. J.* 19, 199–208.

Chen, J. (2020). Construction and empirical study of evaluation Indicator system for world-famous sports cities based on the Delphi method. *Shanghai Univ. Sport.* 28–38. doi: 10.27315/d.cnki.gstyx.2020.000396

Chen, J. X. (2023). Design of an information management system for university student dormitories. *Light Indus. Sci. Technol.* 39, 101–104.

Dai, Z. Z. (2014). Research on clinical nurses' competence in general hospitals. Changchun city, Jilin Province: Jilin University.

Feng, S. S., Lin, J. R., Zhao, S. H., Tian, Y., Zhang, M. (2018). Exploration of the educating mechanism in university student apartments: a case study of Renmin University of China. *Higher Educ. Logist. Res.* 3, 14–16.

Gao, Q. (2009). Statistical analysis of factors influencing public service satisfaction: a case study of university student canteens. *Soft. Sci.* 23:80.

Gronroos, C. A. (1984). Service quality model and its marketing implication [J]. *Europ. J. Market.* 23, 36–44.

Gu, H. M. (2022). Research on the realization path of cultural education in university student dormitories. *Cult. Indu.* 5, 126–128.

Huang, H. N. (2009). The educating function and realization of university student apartments under new circumstances. *Educ. Vocat.* 32, 159–160.

Levitt, T. (1972). Production line approach to service, Harvard Business Review, W. E. Sasser, R. P. Olsen and D. D. Wyckoff (eds). Management of Service Operations: Text, Cases, and Readings[M]. Boston: Allyn and Bacon, 1978.

Li, X. J. (2020). Research on educational pathways for university student dormitories based on student satisfaction. *J. Univ. Logist. Res.* 12, 50–52.

Li, Y. F. (2024a). The educational function and implementation path of university student dormitories in the new era. *J. Univ. Logist. Res.* 1, 24–26.

Li, Y. F. (2024b). The educating function and realization path of university student apartments in the new era. *Higher Educ. Logist. Res.* 1, 24–26.

Lu, H. J., and Lin, X. H. (2016). Discussion on the standardization and normalization of university student dormitory management: Exploration, practice, and improvement of building evaluation. *New West (Theoretical Edition).* 8, 3–64.

Liu, X. G. (2000). On methods to enhance the effectiveness of ideological and political education in universities. *J. Wuhan Univ. Hydraul. Electr. Eng.* 20:54–55+64.

Liu, H. Q. (2015). Research on improving the management satisfaction of student apartments at China University of Petroleum (East China). Qindao City, Shangdong Province: China University of Petroleum (East China).

Lu, H. J., and Lin, X. H. (2016). Discussion on the standardization and Normativeness of university student apartment management: exploration, practice, and improvement of building evaluation. *New West* 8, 63–64.

Luo, C. (2012). Cultural construction of university student apartments from the perspective of ideological and political education. *Sch. Party Build. Ideol. Educ.* 12, 62–63.

Ma, X. (2011). Construction of management and educating positions in university student apartments. Taiyuan City, Shandong Province: North University of China.

Pang, X. B. (2021). Analysis of the path to cultivate Students' awareness of diligence and thrift in universities in the new era. *J. Hetian Normal Coll.* 40, 23–27.

Pang, R., Wang, D., and Ying, Q. L. (2021). Thoughts on fire safety Management in Universities in the new era. *Beijing Educ.* Z1, 92–95.

Parasuraman, A., Zeithaml, V. A., and Berry, L. L. (1988). ERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality. *J. Retail.* 64, 12–20.

Peng, Z. H. (2022). Exploration of the path to improve service quality in vocational college student apartments based on satisfaction surveys: a case study of Liuzhou City vocational college. *J. Jincheng Vocat. Tech. Coll.* 15, 32–34.

Sasser, W. E., Olsen, R. P., and Wyckoff, D. D. (1978). Management of Service Operations: Text, Cases, and Readings(M). Boston: Allyn and Bacon.

Shang, J. F. (2012). Empirical study on after-sales service quality evaluation system of automobile 4s shops based on SERVQUAL. Jiangnan University.

Wei, M. J., and Liu, X. X. (2013). Preliminary exploration of standardized construction of university student apartment management services. *Higher Educ. Logisti. Res.* 2:68–69+73.

Xie, Y. N. (2021). Research on the management and educating path of university student apartments. *Sci. Educ. Guide* 31, 141–143. doi: 10.16400/j.cnki.kjdk.2021.31.047

Xu, W. (2012). Research on the evaluation index system of property service quality in university student apartments. Jinan City, Shangdong Province: Shandong University.

Yin, J., Zou, Q. S., and Zhang, Y. (2024). Constructing a patient satisfaction scale for traditional Chinese medicine hospitals based on the Delphi method and analytic hierarchy process. *Jiangsu Health Care Manag.* 35:190.

Zha, G. Q., Xu, Y. N., Xu, W. J., et al. (2023). Evaluation indicators and methods for university safety education systems from the perspective of comprehensive safety. *J. Safety Sci. Technol. China* 19, 199–208.

Zhang, Z. (2020). Evaluation of university property management service quality: a case study of university C in Henan Province. *Higher Educ. Logist. Res.* 12:58–61+64.

Zhao, X. (2006). Research on the quality of property services in university student apartments: Harbin Engineering University.

Zhao, C. Y. (2017). Research on the quality evaluation of undergraduate public basic courses in ordinary universities. Harbin City, Heilongjiang Province: Zhejiang University.

Zhong, B. (2009). Modeling and empirical study of student life satisfaction evaluation in university logistics based on analytic hierarchy process and grey system theory. Zhejiang University of Technology.

Zhou, M. (2017). Evaluation of property service quality in university student apartments based on the SERVQUAL model. *Contemp. Econ.* 11, 118–119.