



## **Improving the quality of passenger service at Chongqing Jiangbei Airport**

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## Abstract

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<p>The rapid expansion of China's civil aviation industry and the consequent rise in passenger expectations have underscored the importance of systematic service quality evaluation and targeted improvement in airport management. This study investigates passenger service quality at Chongqing Jiangbei International Airport, a major hub in Southwest China, by integrating the traditional SERVQUAL model with the Airport Service Quality program's smart and green indicators. The research aims to identify specific service deficiencies across five dimensions—Tangibility, Reliability, Responsiveness, Assurance, and Empathy—and to propose data-driven, innovation-oriented strategies that align with global best practices and national goals for intelligent and sustainable airport development.</p> <p>A mixed-method approach was employed. Literature review established the theoretical framework combining SERVQUAL and Airport Service Quality; a 30-item, five-point Likert questionnaire was designed and administered both online and on-site, yielding 200 valid responses. Reliability and validity were confirmed via Cronbach's alpha and KMO/Bartlett's tests, while descriptive and distributional analyses highlighted areas of moderate satisfaction and underlying distributional imbalances. Benchmarking case studies of Beijing Daxing and Singapore Changi Airports informed the adaptation of successful practices to the Chongqing context.</p> <p>The results of the research indicated that while core operations generally met expectations, tangible amenities, system reliability under stress, channel responsiveness, standardization of processes, and personalized care exhibited uneven performance. In response, a suite of integrated improvement measures is proposed: ergonomic and energy-efficient redesign of terminal spaces augmented by interactive carbon-footprint visualization; deployment of intelligent operations platforms—incorporating blockchain-backed delay alerts and RFID baggage tracking—supported by a centralized data-dashboard; establishment of an omnichannel service hub with dynamically allocated rapid-response teams; enhancement of staff competence via modular, scenario-based training and external certification plus mystery-shopper audits; and development of passenger-profiling engines, localized cultural experiences, and dedicated "love-channel" escort services for special-needs travelers. Collectively, these strategies offer a coherent roadmap for elevating passenger satisfaction, operational resilience, and sustainable innovation at regional hub airports.</p>
<b>Key words</b> Airport service quality; SERVQUAL; Passenger satisfaction; Intelligent airport; Green airport.

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# 1 Introduction

## 1.1 Research background

The civil aviation industry occupies a strategic position in China's economic and social development, and is both a basic guarantee for the construction of a modernized and powerful country and a driving force for industrial upgrading. As the key carrier of passenger transportation, the service capacity of airports directly determines the efficiency and satisfaction of the air transportation system. With the rapid development of China's civil aviation industry and the increasing demand for passenger travel, airport service quality has become a key factor affecting passenger satisfaction and airport competitiveness. Airport service quality can be defined as the overall evaluation of the airport's performance from the passenger's perspective, encompassing all tangible and intangible aspects of the airport experience (Kazda & Caves 2007, 5). According to the Civil Aviation Administration of China (CAAC), the number of passengers will reach 730.210 million in 2024, an increase from 619.574 million in 2023 (Ceicdata, 2025). As an important aviation hub in Southwest China, Chongqing Jiangbei International Airport is the second busiest airport in mainland China by passenger traffic in 2022 and the sixth busiest airport in 2023 (Wikipedia, 2025). The airport finished 2024 with 48.7 million passengers, an increase of 9%, ranking seventh in the country's airports (Jcdecaux, 2025). Skytrax, an international air transport rating agency, found that some of the service quality ratings of Chongqing Jiangbei Airport were not high enough, and needed to be further optimized and improved (Skytraxratings, 2025).

In the post-pandemic era, the civil aviation industry is accelerating its recovery, and travellers' expectations of airport service quality have increased significantly. Insights from the IATA Global Passenger Survey 2024 show that travellers are increasingly prioritizing convenience and efficiency, with the growing appeal of biometrics and digital identification, and increased technology-driven travel planning and payment preferences (IATA, 2024). At the same time, with the "14th Five-Year Plan" putting forward the strategic requirement of building intelligent and green civil aviation, domestic airports are facing the pressure of service model upgrading and transformation. An intelligent airport leverages advanced information and communication technologies, such as artificial intelligence, big data, and the Internet of Things, to enhance operational efficiency, security, and passenger experience (Graham 2019, 102). A green airport is committed to minimizing its environmental impact through sustainable practices in areas like energy consumption, waste management, and emissions reduction (ICAO 2010, 3).

As an important pivot of the national "Belt and Road" initiative and the western development strategy, the service quality of Jiangbei Airport is not only related to the local economic development,

but also affects the implementation of the national regional development strategy. However, at present, Jiangbei Airport still has obvious deficiencies in terms of passenger-specific services, intelligence level and sustainable development. In order to cope with the increasingly fierce airport competition and escalating passenger demands, there is an urgent need for systematic improvement strategies. This also constitutes the realistic background and main motivation of this study. This study aims to address these challenges by employing the SERVQUAL model, a multi-dimensional instrument designed to measure service quality based on the gap between customers' expectations and their perceptions of the service received (Parasuraman et al. 1988, 17). Ultimately, the goal is to enhance passenger satisfaction, which is a crucial indicator of an airport's success and is directly influenced by the perceived service quality (Oliver 1980, 460).

## **1.2 Research implications**

With the rapid development of the global aviation industry, travellers are increasingly demanding airport services. As one of the major hubs in Southwest China, the improvement of passenger service quality at Chongqing Jiangbei Airport is particularly important. This study is of great theoretical and practical significance to explore the passenger service quality improvement strategy of Chongqing Jiangbei Airport.

This study contributes to the academic field of airport service management by theoretically combining the service quality evaluation theory and exploring the application mode of the theory in a specific region. Based on the theory of passenger satisfaction and loyalty, this study adopts the dimensions of SERVQUAL service quality evaluation model, adds two secondary evaluation dimensions of "intelligent service" and "green service" in the Airport Service Quality (ASQ) system, constructs the airport service quality evaluation system, and explores the feasibility of this service quality evaluation system. The study explores the operability and applicability of this service quality evaluation system. By focusing on an understudied region in China, this study further enriches the existing service quality literature and provides new insights into the complex dynamics between passenger expectations, airport services and operational strategies.

From a practical perspective, the results of this study can provide management of Chongqing Jiangbei Airport with practical strategies to improve passenger satisfaction, reduce service gaps, and thus enhance the airport's brand image and market competitiveness. As airport infrastructure and operations expand, it is important to align service quality with global best practices to meet international passenger expectations. Improving service quality not only enhances the passenger experience, but also improves the overall operational efficiency and profitability of airports, laying a

solid foundation for their sustainable development. As an important transportation hub, the improvement of passenger service quality at airports will also drive the development of tourism and hotel industries in the surrounding areas and promote regional economic development. At the same time, the study of service quality improvement strategies for airports in the region provides a reference for other airports with similar problems.

### **1.3 Research objectives and content**

#### **1.3.1 Research objectives**

The main purpose of this study is to explore and propose strategies to improve the current passenger service quality of Chongqing Jiangbei Airport. This paper takes Chongqing Jiangbei Airport passenger service quality and its related factors as the research object. Firstly, the questionnaire is designed based on the current situation of airport passenger service combined with passenger satisfaction theory, SERVQUAL service quality model and ASQ standard, secondly, relevant data are collected and counted, and then the problems and challenges in passenger service at the airport are identified. Finally, based on this foundation, drawing on the successful experiences and innovations of advanced airports at home and abroad, we come up with targeted strategies that can improve the quality of passenger service in this airport, so as to improve passenger satisfaction, enhance the competitiveness of the airport, and provide a strong support for the sustainable development of the airport.

#### **1.3.2 Research content**

The main framework of this study is divided into seven sections, which are Introduction, Theoretical Framework, Survey on Service Quality Status and Satisfaction in Chongqing Jiangbei Airport, Analysis of Service Quality Problems in Chongqing Jiangbei Airport, Case Studies of Advanced Airports at Home and Abroad, Strategies and Suggestions for Service Quality Improvement in Chongqing Jiangbei Airport, and Summarization and Prospect.

Firstly, this paper will introduce the research background, significance, purpose and content, research methodology and innovations to the overall study to help readers have a preliminary understanding of the study. Secondly, it will pave the way and provide theoretical support for the study from the theoretical framework of service quality evaluation theory, passenger satisfaction and loyalty theory, and innovative strategy theory for service quality improvement. Then, the study will briefly summarize the current situation of Chongqing Jiangbei Airport, on the basis of which, based on SERVQUAL model indicators and ASQ evaluation indicators, the evaluation system is con-

structured, combined with the actual situation, the questionnaire is designed and the research is carried out. Based on the analysis of the results of the questionnaire survey, this study combines the development status quo, analyzes in-depth the problems of airport service quality, and combines the successful experience and innovation points of Singapore Changi Airport and Beijing Daxing International Airport, and arrives at a conclusion that centers around tangibility, reliability, responsiveness, assurance, and empathy. It also draws strategies to improve airport passenger service quality around tangibility, reliability, responsiveness, assurance, and empathy, and finally summarizes and outlooks the study.

This study focuses on three core questions: first, how to effectively construct a service quality evaluation system? Second, what are the problems of airport service quality based on passenger service satisfaction? Third, what are the innovative strategies to improve airport service quality?

Based on the above questions, the main objectives of this study include: combining the SERVQUAL model and the ASQ system standard, constructing an evaluation index system for the public services of Chongqing Jiangbei Airport; searching for the gaps in the airport's service quality based on the results of the questionnaire survey and quantifying the importance of the dimensions; designing targeted service quality enhancement strategies, taking into account the feasibility and innovativeness; and proposing intelligent and green service optimization scheme to promote the sustainable development of airports; form a replicable and scalable service quality improvement template for feeder hub airports to promote the high-quality development of the civil aviation industry.

Based on the research questions and objectives, the stacked matrix model shown in **Table 1** below was set up to include the survey questions to help understand the logical lines of this study.

**Table 1.** Overlay matrix of investigation questions of the study

Investigative questions	Theoretical framework (chapter)	Results (chapter)	Questionnaire questions
How satisfied are travellers with their direct contact and perception of the physical facilities and environment of the airport? (Tangibility)	2.1.2	4.1	1-6
How effective and stable is the airport's handling of information and services? (Reliability)	2.1.2	4.2	7-12

How responsive is the airport to passenger needs? (Responsiveness)	2.1.2	4.3	13-18
How professional, standardized and safe are the airport's services? (Assurance)	2.1.2	4.4	19-24
How satisfied are passengers with the personalized and diversified services provided by the airport? (Empathy)	2.1.2	4.5	25-30

**Table 2.** Overlay matrix of investigation questions of the study

## 1.4 Research methods and innovations

### 1.4.1 Research Methods

This study adopts the combination of literature research method, questionnaire survey method and comparative research method to systematically investigate the current situation of service quality and optimization strategy of Chongqing Jiangbei Airport.

First of all, the relevant theories of airport service quality evaluation at home and abroad are sorted out through the literature research method, focusing on the SERVQUAL model, the theory of passenger satisfaction and loyalty, and the theory of innovative strategies for service quality enhancement, analyzing the core viewpoints and evaluation indexes of the existing studies, and laying a theoretical foundation for the present study. Meanwhile, the service quality evaluation system applicable to Chongqing Jiangbei Airport is constructed by combining the ASQ standard of the International Air Transport Association (IATA).

Secondly, the questionnaire survey method was used to collect the actual perception data of passengers on airport services. Based on the five dimensions of the SERVQUAL model (tangibility, reliability, responsiveness, assurance, and empathy), a Likert five-level scale questionnaire was designed to cover a variety of key service aspects. The questionnaire was distributed using a combination of online and offline methods to ensure a broad and representative sample. After the data were recovered, SPSS and other statistical software were used to conduct reliability and validity tests, descriptive statistics, and identify the shortcomings of current service quality and the direction of improvement.

Finally, using the comparative research method, Singapore Changi Airport and Beijing Daxing International Airport are selected as benchmarking cases to analyze their successful experiences in

different aspects. By comparing the differences between the airports, the optimization strategies that can be learned from them are refined, and targeted improvement suggestions are put forward in combination with the actual situation of Chongqing Jiangbei Airport.

The combined use of these three methods ensures the theoretical depth of the study and draws scientific conclusions based on empirical data, while drawing on advanced international experience to make the research results more valuable for practical guidance.

#### **1.4.2 Research innovations**

Firstly, on the theoretical level, this study adds two new dimensions, “smart service” and “green service”, which reflect the characteristics of the development of contemporary airports, on the basis of the traditional service quality evaluation model, and constructs a more comprehensive evaluation system. Secondly, we reviewed the literature and found that although there are a lot of results, the research objects are mainly large international airports, and the research on the service quality of regional airports, such as Chongqing Jiangbei, is still limited, and the results of its analysis are not comprehensive enough. Therefore, this study bridges the gap by providing insights into the situation of Chongqing Jiangbei Airport, which can further contribute to the academic field of airport management and the actual development of this airport. Finally, it is a practical innovation that proposes a series of actionable improvement measures for the specific situation of Chongqing Jiangbei Airport, which have absorbed the experiences of advanced international airports and taken into account the actual conditions of medium-sized hub airports.

## 2 Theoretical framework

### 2.1 Airport Service Quality Evaluation Theory

#### 2.1.1 SERVQUAL Model

Airport service quality evaluation is a key component in understanding and improving the operational performance of airports and enhancing the passenger experience. Service quality plays a crucial role in the air transportation industry, and it directly affects passenger satisfaction, loyalty, and the reputation and competitiveness of airports. A systematic and scientific evaluation of airport service quality can not only identify the weak links in the service and provide management with a basis for decision-making, but also help airports better understand the needs and expectations of travellers, so as to develop more effective service improvement strategies.

Among the many service quality evaluation models, the SERVQUAL model proposed by Parasuraman, Zeithaml and Berry in 1988 has been widely used in various service industries, including the air transportation industry. The SERVQUAL model evaluates the service quality by measuring the gap between the customer's perceived service and the desired service, which centers on the identification of five key dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy (Parasuraman et al. 1988, 14). Tangibles mainly refer to the hardware facilities, spatial environment, visual signage, service personnel instrumentation, and other elements that passengers can directly perceive, influencing both operational efficiency and passengers' subjective feelings (Kasim & Warnaby 2012, 20). Reliability refers to the consistency, stability, and trustworthiness of an airport in providing services, directly reflecting its guarantee capability and operational efficiency (Chang et al. 2011, 1151). Responsiveness reflects whether the airport can provide rapid feedback and effective help when travelers encounter problems or make demands, focusing on the flexibility of the service mechanism, the smoothness of channels, and the timeliness of implementation (Fichert & острый 2010, 208). Assurance is the institutional foundation of service quality, reflecting the degree of trust travelers have in the service provider's professional competence, operational standardization, and risk control (Kang et al. 2000, 271). Empathy concerns whether airport services pay attention to the individual differences and emotional demands of travelers, and is an important dimension for measuring humanistic care and service temperature (Zeithaml et al. 1996, 36).

The SERVQUAL model diagnoses service quality problems by designing questionnaires with both expectation and service perception components and calculating gap scores on the five dimensions (Parasuraman et al. 1991, 422).

The SERVQUAL model has been widely used in airport service quality evaluation studies due to its simplicity and generalizability. Many researchers have used the SERVQUAL model to assess the service quality of different airports, identify gaps in passenger perceptions, and suggest improvements. However, with the development of the aviation industry and the increasing complexity of passenger needs, the traditional SERVQUAL model has shown some limitations in assessing the service quality of modern airports. Especially in the context of intelligence and greening becoming the new trend of airport development, the SERVQUAL model's coverage of these emerging dimensions is slightly insufficient.

In recent years, scholars have continued to apply and innovate the SERVQUAL model in the field of air service quality evaluation, with a view to better capturing the specificities of the air transportation industry and the changes in passenger demand. On the one hand, researchers are committed to verifying the applicability and reliability of the SERVQUAL model in different cultural contexts and aviation markets. On the other hand, in response to the inherent limitations of the SERVQUAL model, such as its generalizability that may not fully cover the service characteristics of a specific industry, scholars have attempted to revise and extend it to improve its accuracy and applicability in the evaluation of aviation service quality.

One common innovation path is to adjust or supplement the dimensions of the SERVQUAL model according to the characteristics of the air transportation industry. For example, Gilbert and Wong (2003) proposed a model containing seven dimensions of reliability, responsiveness, assurance, customization, staff, facilities, and flight patterns, which are considered to provide a more comprehensive assessment of air service quality. Other studies have attempted to add new dimensions to SERVQUAL's five traditional dimensions to reflect emerging service elements. As this study focuses on smartness and greenness, in recent years scholars have begun to explore the roles of Technology Integration and Sustainability in the evaluation of air service quality (text-mining studies based on online customer reviews may reveal new service quality dimensions. Park et al. (2019) study emphasized the impact of comfort and convenience of the airport environment on passenger satisfaction, which is related to the tangibility dimension, but also highlighted elements specific to the airport environment (Park et al., 2019, 78). These studies recognize that in today's world of increasing digitalization and environmental awareness, airport performance on these two dimensions has a direct impact on passenger satisfaction and loyalty.

In addition, some researchers have explored ways to combine the SERVQUAL model with other quality management tools to more comprehensively analyze and improve air service quality. For example, combining SERVQUAL with quality function rollout aims to translate travellers' needs into

specific design and operational requirements. This integrated approach helps airports more effectively incorporate passenger expectations into service improvement practices.

ASQ is the world's leading passenger satisfaction program developed and managed by the Airports Council International (ACI), which uses standardized questionnaires to assess, from the passenger's perspective, satisfaction with more than 30 key service areas provided by airports. Satisfaction in more than 30 key service areas covering all aspects of the passenger experience at airports, such as check-in, security, boarding, transfers, dining and shopping, and amenity convenience (ACI, 2019). The ASQ system not only provides a global benchmark for airports to compare service performance, but also helps airports to identify opportunities for improvement through ongoing passenger feedback to enhance passenger satisfaction and loyalty (ACI, 2019). Notably, the ASQ system includes specific metrics related to smartness and greenness, such as passenger ratings of the quality of airport Wi-Fi, satisfaction with the efficiency of self-check-in and baggage check-in, and perceptions of the airport's environmental practices.

### **2.1.2 Basic Structure of the SERVQUAL Model Scale**

In this study, the SERVQUAL model will be used as a basic framework for assessing the core service quality of Chongqing Jiangbei Airport, which identifies the problems of the airport in terms of basic services by measuring the gap between passengers' perceptions and expectations in the five traditional dimensions of tangibles, reliability, responsiveness, assurance and empathy. At the same time, the SERVQUAL model is supplemented with relevant indicators on intelligence and greening in the ASQ system, such as passengers' satisfaction with self-service facilities, evaluation of airport information technology applications, and perception of airport environmental protection measures, to construct a more comprehensive and contemporary airport service quality evaluation system. By designing a questionnaire survey containing these dimensions, this study aims to gain a more in-depth and accurate understanding of passengers' overall evaluation of Chongqing Jiangbei Airport's service quality, and to identify strengths and weaknesses in terms of intelligence and greening, in order to lay a solid theoretical foundation for the subsequent proposal of targeted enhancement strategies. According to the object of this study, the five abstract dimensions of the SERVQUAL model and the two indicators in the ASQ system are concretized as follows.

Tangibility refers to the physical facilities and environment in the airport that can be directly contacted and perceived by travellers, which is the most intuitive and basic component of airport services. After entering the airport, the first level of perception comes from the physical space and functional facilities of the airport, which together constitute the initial cognition of the overall image of airport services. The tangible nature of the airport is reflected in many aspects, mainly including

the configuration and comfort of the seats in the waiting area, the green concept in the space design, the abundance of self-service equipment, the clarity of the signage and guidance system, the cleanliness and maintenance of the environment, as well as the availability of convenient equipment such as baggage carts, and so on.

The distribution, quantity and comfort of the seats in the waiting area directly affect the waiting experience of passengers in the airport. Reasonable ergonomic design, sufficient quantity and reasonable distribution can significantly enhance the comfort of the passengers before they board the plane. Whether or not green building concepts are incorporated into the design of the airport environment, such as natural lighting, green plant arrangement and the use of environmentally friendly materials, etc., also reflects the airport's concern for and investment in sustainable development, which not only helps to enhance the psychological comfort of travellers, but also reflects the airport's active role in environmental protection responsibilities. The types and distribution of self-check-in, boarding equipment and charging facilities affect the convenience of the operation process and the ability of passengers to obtain information on their own. A clear and easy-to-understand guidance system, including physical signs and mobile navigation tools, is a key part of efficiently completing the passenger flow path, especially important for travellers who are unfamiliar with the layout of the terminal. Additionally, the adequacy, functionality and hygiene of luggage trolleys reflect the level of service delivery. In summary, the various components of tangibility together construct the first impression of airport service quality for travellers, which is an important dimension that should not be ignored in the evaluation of airport services.

Reliability in the civil aviation airport service system is reflected in the accuracy, consistency and predictability of service content. As a highly standardized public service space, whether an airport's operation mechanism is sound and its service delivery is consistent is directly related to the level of passenger trust. In travellers' actual experience, reliability is mainly reflected in the release and update of flight information, the accuracy and efficiency of baggage handling, the stability of the service process and the effectiveness of emergency response.

The timeliness and accuracy of flight information updating is the core basis for travellers to arrange their trips, and any error may cause greater trouble to travellers and even trigger chain trip problems. The waiting time and mismatch rate in the baggage claim process reflect the professionalism of the airport in ground service operation, which is of immediate interest to passengers. Passengers are also concerned about whether airports are able to maintain orderly and consistent service processes at different times of the day or in the face of heavy traffic pressure. In addition, when faced with flight delays, weather changes or other emergencies, the soundness and efficiency of an airport's emergency response mechanism becomes a key indicator of reliability. The stable

availability of Wi-Fi network and internal transportation (e.g., shuttle buses) reflects the basic protection capability provided by the airport to enhance the overall service experience, and these “non-core but indispensable” service links further enrich the dimension of passengers' perception of airport reliability.

Responsiveness is a measure of the speed and efficiency with which an airport can provide assistance and feedback to travellers in response to their needs. Responsiveness not only reflects the flexibility and humanization of the airport service system, but also reflects the ability of the service provider to pay attention to the immediate needs of passengers. In a high-traffic, high-pressure operational scenario, the ability of an airport to respond to all types of passenger requests in a timely manner has a direct impact on their service satisfaction and overall experience.

When a passenger seeks assistance, the speed of staff response and the efficiency of the system is the first point of experience, reflecting the maturity of staff training and service mechanism. When encountering service problems, such as flight changes or baggage problems, whether passengers can quickly find a service point or get effective help demonstrates the rationality and systemic nature of the airport service layout. With the development of digital services, passengers rely more and more on mobile apps, official applets or WeChat service numbers to obtain information. If such systems perform well in terms of operability, response speed and information accuracy, it will greatly enhance service satisfaction. In peak or emergency situations, the ability of staff to respond immediately is particularly important, and their organizational and coordination skills are also tested. In addition, airports should be able to provide quick access and services for special passengers (e.g. mobility impaired). Whether or not the information desk is equipped with multilingual staff also reflects the level of internationalized services and the ability to respond to the diversified needs of passengers.

Assurance refers to the professionalism, standardization and safety of the service process in the process of service delivery, which is the protection of passengers' basic service rights and interests. Its core is to ensure the professional delivery and stable operation of services, so that passengers can complete the travel process with peace of mind and smoothly. In civil aviation airports, the guarantee is reflected in the staff's service quality, the standardization of all kinds of operating procedures, the soundness of the service quality management system and the degree of passenger trust in the airport's ability to continuously improve its services.

First of all, the performance of airport staff in terms of communication attitude, service awareness and skill level are the most direct manifestation of assurance. Whether the processes in core service areas such as check-in, security check, and inquiry are standardized and run in an orderly

manner is an intuitive test of the airport's management mechanism and execution. Whether passengers feel at ease with the stability of the airport's service quality and believe that the airport has the ability to continuously optimize its services is also an important factor in measuring security. In addition, the voice clarity and coverage of broadcast notification systems involving public safety, such as boarding reminders and safety alerts, are also aspects that should not be ignored. Finally, whether passengers have a clear sense of direction and security in the terminal building, such as the visibility of security personnel, the effectiveness of the patrol system, etc., is also an important initiative for airports to create a safe atmosphere for passengers and provide psychological security.

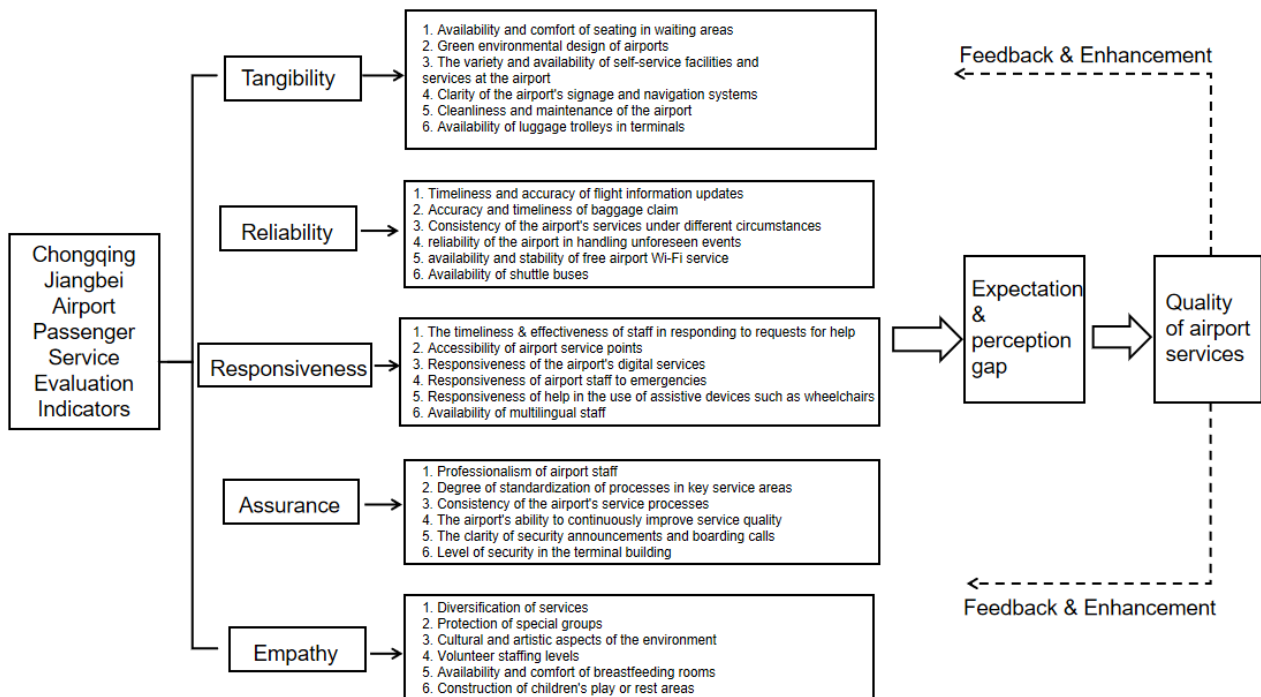
Empathy is a capability that has been increasingly emphasized in modern public services, which refers to whether airports are able to understand and care for the individual needs of different groups of passengers. Empathy not only reflects the degree of humanistic care of the service, but also reflects the initiative and ability of the airport in providing precise and flexible services. With the diversification of passenger groups, airport services are no longer the simple implementation of standardized single processes, but should provide customized and diversified service options while guaranteeing basic services.

Whether airports take into account the differences in the needs of different travellers and fully reflect this in their service design is an important measure of empathy. For example, the provision of barrier-free access and exclusive assistance services for special groups such as the elderly, children and people with disabilities directly affects their travel convenience and sense of security. In addition, cultural and aesthetic elements in the waiting environment, such as art installations and leisure spaces, not only enhance the overall atmosphere of the airport, but also satisfy the needs of travellers at the spiritual level. In case of emergency, whether travellers can quickly get effective assistance from staff or volunteers is a concrete reflection of the sensitivity and resilience of airport services. The setup and comfort of mother and baby rooms and children's activity areas reflect the meticulousness of the airport's services in taking care of family travellers. Overall, empathy reflects whether airport services are people-oriented and whether they are able to reflect care in the details to enhance passengers' sense of belonging and satisfaction.

Intelligent service and green service are the dimension indicators that the ASQ system, which combines the development trend of the modern aviation industry, focuses on, and they are the main trends for the development of civil aviation airport service quality. Intelligent service includes passengers' preference requirements for non-contact services, advanced intelligence of airport facilities and equipment, and intelligence of airport services, reflecting the development trend of modern airport intelligence. Green service includes the formation and requirements of passengers' green

awareness in the general environment, the convenience of airport environmental protection facilities, and the awareness of sustainable airport services, which is in line with the demand for low-carbon development of civil aviation industry. Therefore, this paper refines these two important indicators in line with the development requirements of the times into the secondary indicators of the measurement dimension, reflecting the passengers' demand for airport intelligence and green.

The specific design of the indicators is shown in Figure 1 below:



**Figure 1.** Passenger service evaluation index of Chongqing Jiangbei Airport

## 2.2 Passenger Satisfaction and Loyalty Theory

Passenger satisfaction and loyalty are key indicators of the success of airport service quality, and they not only directly affect travellers' willingness and word-of-mouth communication, but also are crucial to the long-term development and market competitiveness of airports.

Passenger satisfaction is the overall evaluation of passengers' perceived service quality compared to their own expectations after receiving airport services (Oliver 1980, 462). Passengers are satisfied when the perceived service exceeds their expectations and vice versa. High levels of passenger satisfaction are the cornerstone of building passenger loyalty (Anderson & Sullivan 1993, 130). Passenger loyalty, on the other hand, is the persistent preferences and behaviors that travellers

exhibit towards a specific service provider (in this study, Chongqing Jiangbei Airport) based on satisfaction (Oliver 1999, 36). Loyal travellers are more likely to choose that airport, are less price-sensitive, and are willing to recommend that airport to others, resulting in a stable source of passengers and a positive word-of-mouth effect for the airport. Therefore, understanding the factors that influence passenger satisfaction and loyalty is crucial to developing effective service enhancement strategies.

Of particular interest is the fact that in recent years customer experience has become a central concept in examining passenger satisfaction and loyalty in airport service quality evaluation studies. Scholars have argued that an exceptional customer experience encompasses passengers' perceptions and interactions at all touchpoints with the airport, including functional, emotional, and relational aspects, and is key to driving passenger satisfaction and building enduring loyalty (Hwang & Hyun 2018, 21). Creating a seamless, personalized, and positive passenger journey is more effective in increasing overall passenger satisfaction and willingness than focusing solely on the quality of a single service component. In research on airport service quality evaluation, scholars have begun to adopt a more holistic view of service quality as the basis for building a positive customer experience, which in turn affects passenger satisfaction and ultimately loyalty (ACI 2019, 23). More studies have innovated and extended evaluation studies of service quality on the five traditional dimensions based on the SERVQUAL model, which has a significant impact on passenger satisfaction and indirectly acts on loyalty behavior.

In this study, the theory of passenger satisfaction and loyalty will be used as a key theoretical framework to assess the effectiveness of service quality improvement in Chongqing Jiangbei Airport. The data on passengers' perceptions of airport service quality dimensions collected through questionnaires will be mainly used to analyze their direct impact on passenger satisfaction. Drawing on recent research on the application of customer experience and SERVQUAL dimensions in service quality, the questionnaire designed for this study will also involve topics that measure passengers' overall airport experience and perceived value in the five dimensions, in order to more comprehensively understand the deeper reasons affecting passenger satisfaction and loyalty, summarize and analyze the problems that exist in the airport's service quality, and thus provide theoretical support for the development of a more effective service enhancement. This will provide theoretical support for Chongqing Jiangbei Airport to formulate more effective service enhancement and loyalty cultivation strategies.

### 2.3 Existing Innovative Strategies for Airport Service Quality Improvement

The enhancement of airport service quality is a continuous evolutionary process. With the advancement of science and technology, the increasing diversification of passenger needs, and the intensification of competition, traditional service modes and service strategies are no longer able to meet the operational needs of modern airports. Therefore, researching and applying innovative service quality improvement strategies is crucial for airports to maintain their competitive advantage and attract and retain passengers. In recent years, many innovative strategies have emerged, aiming to enhance the service quality of airports from different perspectives and ultimately improve the overall passenger experience.

Among them, Customer Experience Management (CEM) has emerged as one of the core concepts in airport service quality enhancement. CEM emphasizes the integration of all touchpoints with the airport from the travellers' point of view to create a seamless, personalized, and positive traveller journey (Pullman & Gross 2004, 553). This includes the entire process from the passenger's arrival at the airport, check-in, security, waiting, boarding, arrival, and departure from the airport. The CEM strategy emphasizes the importance of emotional factors in the passenger experience and aims to create a positive emotional connection by delivering services that exceed expectations, thereby increasing passenger satisfaction and loyalty (Alizadeh et al. 2018, 72).

Technological innovations are playing an increasingly important role in improving the quality of airport services. For example, the application of Internet of Things (IoT) technology can realize intelligent monitoring and management of airport facilities and equipment, enhancing operational efficiency and service reliability (Yan et al. 2018, 62721). Big data analytics can help airports better understand passengers' needs and behavioral patterns so that they can provide personalized services and products (Kulkarni & Kulkarni 2017, 3706). Artificial intelligence (AI) technology, on the other hand, can be applied to intelligent customer service, self-service, and security check process optimization to enhance service efficiency and passenger experience (Tu et al. 2019, 3).

Sustainable development Gradually becoming an important consideration for the improvement of airport service quality. Travellers are increasingly concerned about the environmental protection and social responsibility of airports, so airports need to take measures to reduce carbon emissions, conserve energy, manage waste, and provide environmentally friendly facilities and services (Upham et al. 2003, 271). This will not only help to enhance the image of the airport but also attract more environmentally conscious travellers.

In this study, these innovative service quality improvement strategies will provide important ideas and references for the service improvement of Chongqing Jiangbei Airport. By analyzing the cases of advanced airports at home and abroad, this study will explore how to integrate the CEM concept into the operation of Chongqing Jiangbei Airport, how to use technological innovation to enhance service efficiency and passenger experience, and how to incorporate sustainable development into service quality improvement considerations. The results of the study will provide theoretical support for Chongqing Jiangbei Airport to develop more forward-looking and innovative service improvement strategies.

### 3 Case studies of advanced airports in China and abroad

#### 3.1 Beijing Daxing International Airport

Beijing Daxing International Airport, a mega international aviation hub that has attracted much attention in China and around the world, has demonstrated a number of successes and innovations that other airports can learn from since it began operations, based on its forward-thinking design concepts and high attention to passenger service. Its fundamental success lies in the integration of cutting-edge technology, human-centered design principles, and a forward-thinking approach to operational efficiency aimed at optimizing the passenger journey from arrival to departure.

First and foremost, Beijing Daxing International Airport has placed a high priority on modernizing and forward-thinking infrastructure from the very beginning of its planning. Its signature radial five finger corridor design significantly reduces the walking distance from the center of the terminal to each gate, which greatly improves passenger convenience over traditional linear or centralized terminals, especially for transit passengers and passengers with mobility impairments (Performanceinlighting, 2025). This human-centered design concept takes into account the fatigue and time pressure of travellers in large airports, and by optimizing the spatial layout, it directly improves the travel efficiency and comfort of passengers.

In addition to architectural ingenuity, Beijing Daxing Airport has adopted a comprehensive range of technological innovations to enhance the passenger experience. The widespread deployment of self-check-in and baggage check-in kiosks gives passengers greater autonomy and reduces reliance on traditional check-in counters, freeing up staff time to handle more complex passenger needs. An advanced baggage handling system using Radio Frequency Identification (RFID) technology ensures that baggage is sorted and delivered more accurately and quickly, minimizing the incidence of lost or delayed baggage, which is a major cause of passenger dissatisfaction (Gihub, 2020). In addition, the airport has pioneered the use of facial recognition technology at all stages of the passenger journey, including security checks and boarding gates (Telpo, 2025). This not only enhances security protocols by providing a stronger and more efficient means of authentication, but also helps to create a smoother and more contactless passenger experience, in line with contemporary health and safety requirements. A comprehensive mobile application integrated within the airport provides passengers with real-time flight information, gate changes, directions, and a variety of airport services, putting vital information and control directly into the hands of the traveller.

Daxing International Airport also places great emphasis on creating a comfortable and pleasant environment for travellers. The design of the terminal building introduces ample natural light through wide skylights and glass curtain walls, creating a more airy and welcoming atmosphere than traditional enclosed airport spaces (Zaha-hadid, 2025). The integration of biophilic design elements such as green spaces and indoor gardens aims to reduce passenger stress and create a more soothing pre-flight environment. Diverse retail and dining options cater to travellers with different tastes and budgets, ensuring that passengers have ample opportunities to relax and interact while at the airport. In addition, the airport has invested in providing high-quality amenities such as comfortable seating areas, ready-to-use charging stations, and free high-speed Wi-Fi throughout the terminal, recognizing the importance of these seemingly small details in improving overall passenger satisfaction.

In terms of operational efficiency, Beijing Daxing Airport has implemented a Resource Allocation Intelligence System, including automated gate assignments and optimized aircraft taxi routes, which not only reduces operational costs, but also minimizes delays and improves on-time performance, directly benefiting passengers. The seamless integration of multiple transportation modes, such as high-speed rail, intercity buses and airport express lines, provides passengers with convenient and efficient options for entering and exiting the airport and connecting to the downtown area and surrounding areas. The design of this multi-modal transportation hub emphasizes a commitment to connectivity and accessibility, further enhancing the airport's role as a major international gateway.

In addition, Beijing Daxing has incorporated sustainable development principles into its design and operations. The airport employs energy-efficient technologies such as solar power and rainwater harvesting, and prioritizes waste management and emissions reduction (Xylem, 2019). Although it is not a direct passenger service, this commitment to sustainability resonates with a growing number of environmentally conscious travellers and contributes to a positive view of the airport as a whole.

All in all, Beijing Daxing International Airport successfully combines innovative design, advanced technology and a strong focus on passenger needs to provide an attractive model for future airport development. Its radial terminal design, extensive use of self-service and biometrics, commitment to passenger comfort and convenience, efficient operational systems, and integration of multimodal transportation and sustainability initiatives provide valuable lessons for other airports striving to enhance passenger service and operational excellence in an increasingly demanding global aviation landscape. The emphasis on a holistic approach, where every aspect of the airport experience is

carefully considered and optimized, is a key takeaway for airports seeking to raise service standards and meet the evolving expectations of the modern passenger.

### **3.2 Singapore Changi International Airport**

Recognized globally as an aviation hub of excellence, Singapore Changi International Airport's successes and innovations in passenger services have set a benchmark for other airports to emulate. It is no coincidence that Changi Airport has continued to be recognized as the World's Best Airport for many years, but it is the result of its dedication to excellence and innovation in all aspects of the passenger experience. At the heart of its success lies a passenger-centric service philosophy that is embedded in every detail of the airport's design and every aspect of its operations.

Firstly, Changi Airport has demonstrated a deep understanding of passenger needs in its infrastructure development. Its modern terminal design is not only aesthetically pleasing, but also focuses on functionality and convenience. For example, efficient Skytrain and bus connections between terminals minimize transfer times. The airport's clear and unambiguous signage system, multi-language signage and the presence of service staff everywhere greatly enhances the navigation experience for travellers and reduces the anxiety of getting lost. In addition, Changi Airport understands the needs of connecting passengers and therefore offers a wealth of facilities and services in the connecting area, including comfortable lounge areas, shower facilities, and even free movie theaters and sleeping pods to make even long-waiting passengers feel comfortable and convenient. Notably, the airport experience has been elevated to a new level with the inauguration of Changi Airport's iconic Jewel Changi Airport. This complex of natural landscapes, shopping, dining and recreation not only provides travellers with a wide range of activities, but has also become a new landmark in Singapore, attracting a large number of non-travellers. This innovative concept of making the airport part of the destination has greatly enhanced the attractiveness of the airport and the overall satisfaction of travellers.

Secondly, Changi Airport is also actively innovating in its service processes and technology applications to provide an efficient and convenient experience for travellers. The widespread use of self-service check-in and baggage check-in systems has effectively shortened the time travellers spend queuing at counters. Changi Airport is also one of the early adopters of the Automated Border Control System (ABCS). Through biometrics, Singapore residents and eligible foreign travellers can fast-track their immigration procedures, greatly enhancing clearance efficiency. In recent years, Changi Airport has also been actively exploring contactless services and automation technologies, such as the introduction of proximity sensing technology at self-service terminals to reduce the

need for travellers to touch screens (CAN, 2020). Changi Airport has also partnered with technology companies to test automated baggage handling robots to improve the efficiency and accuracy of baggage handling. The use of these technologies not only improves operational efficiency, but more importantly, provides passengers with a smoother and safer travel experience.

Again, Changi Airport has gone to great lengths to enhance the passenger experience. The airport is well covered with greenery to create a fresh and comfortable environment, and themed gardens such as the Orchid Garden and Sunflower Garden provide a place for travellers to relax and unwind. Art installations and cultural exhibitions are located throughout the airport, providing travellers with visual treats and showcasing Singapore's diverse culture. Changi Airport is also sensitive to the needs of family travellers, providing well-equipped mother and baby rooms and children's play areas. For passengers with special needs, such as those with mobility or invisible impairments, Changi Airport also provides thoughtful services and support, such as the CARE@Changi program that aims to provide extra help and convenience to passengers with special needs (Moodiedavittreport, 2025). Changi Airport also has a dedicated team of staff to help travellers with special needs.) Changi Airport also has a team of hundreds of Changi Service Ambassadors, who are friendly and ready to provide advice and assistance to travellers, creating a hospitable atmosphere at the airport.

Last but not least, Changi Airport also excels in customer feedback and continuous improvement. The airport has multiple channels to collect travellers' opinions and suggestions, including an online feedback platform and touch-screen survey terminals. By carefully analyzing and actively responding to passenger feedback, Changi Airport is able to identify shortcomings in its services and make improvements in a timely manner. Changi Airport also incentivizes its staff and partners to deliver service excellence through various reward programs such as Valuing Our Tenants Excellent Service (VOTES). Changi Airport also conducts regular employee satisfaction surveys, recognizing that employees are the key to service excellence, and by increasing employee engagement and satisfaction, the overall level of service is enhanced.

To summarize, Singapore Changi International Airport's successes and innovations in passenger services are multi-dimensional and systematic, and are worthy of in-depth study and reference by other airports. Its human-centered design philosophy, active embrace of technology, continuous improvement of passenger experience, and emphasis on customer feedback and staff motivation have all contributed to its leading position in the global aviation industry.

### 3.3 Insights and Implications

An in-depth analysis of the successful experiences and innovative practices of Beijing Daxing International Airport and Singapore Changi International Airport in terms of passenger service can provide many valuable insights and lessons for other airports to improve their service quality. Despite their differences in geographic location and cultural background, these two leading global aviation hubs have demonstrated excellent service levels and the ability to continuously innovate, driven by a passenger-centered service philosophy. Their common success lies in their deep insight into passenger needs, active adoption of advanced technologies and extreme pursuit of service details.

An important lesson is that airport design concepts must be centered on enhancing passenger convenience and comfort. The radial finger corridor design of Beijing Daxing Airport and Changi Airport's efficient terminal connectivity system have significantly shortened walking and transfer distances for passengers, which is directly related to passenger fatigue and time pressure within large airports. Therefore, future airport planning and expansion should pay more attention to optimizing spatial layout and streamlining passenger movement, such as adopting more intuitive navigation systems and more convenient internal transportation modes, in order to maximize passenger travel efficiency. The airport's infrastructure should also take into account the diverse needs of travellers by providing adequate and high-quality rest areas, dining and shopping options, as well as user-friendly amenities such as mother and baby rooms and barrier-free facilities. Changi Airport's innovative "Star Changi" model is a good example of how to turn an airport into a multi-functional complex, which not only enhances the airport's attractiveness, but also provides passengers with a richer travel experience.

Intelligence is a key driver in improving the quality of airport services. Both Beijing Daxing Airport and Changi Airport have actively explored and applied intelligence. The extensive use of technologies such as self-check-in, baggage check-in, biometric security and boarding has significantly improved passenger processing efficiency, reduced waiting time in queues and provided passengers with greater autonomy. In the future, airports should further increase their investment in the field of intelligence, such as using big data analysis to predict passenger flow and optimize resource allocation; introducing AI customer service to provide personalized information consultation and navigation services; and promoting contactless services to enhance the sense of travel safety under the normalization of epidemics. In addition, the application of IoT technology can realize intelligent monitoring and management of airport facilities and equipment, enhance operational efficiency, and provide more reliable service guarantee for passengers.

Greening has become an important trend in global sustainable development and an important aspect in improving the quality of airport services. Beijing Daxing Airport has incorporated a number of sustainability concepts into its design and operation, such as energy-efficient building design, renewable energy utilization and rainwater harvesting system. Although Changi Airport has not elaborated on greening measures in the text, as a leading international airport, its efforts in environmental protection are equally worthy of recognition. Future airport development should place greater emphasis on greening, such as adopting more energy-efficient building materials and lighting systems, promoting electric vehicles and clean energy, and implementing stricter waste management and recycling measures to minimize environmental impacts. The green image of airports will not only help enhance their social responsibility, but also create a healthier and more comfortable travel environment for passengers.

In addition, the continuous optimization of service processes and the enhancement of staff service awareness are also important in improving the quality of airport services. Changi Airport has significantly improved the efficiency of passenger clearance through the extensive use of self-service technology and the optimization of border control processes. At the same time, the warmth, friendliness and professionalism of its Changi Service Ambassadors have created a positive service atmosphere for travellers. Airports of the future should continue to streamline their service processes, reduce unnecessary steps and utilize technology to improve efficiency. More importantly, it is important to focus on staff training and motivation, cultivate staff's awareness of passenger-centered service, and improve their professional skills and communication abilities, so as to provide passengers with better quality and personalized service. Establishing a perfect customer feedback mechanism, actively listening to passengers' opinions and suggestions, and transforming them into motivation for service improvement is the key to achieving continuous improvement of service quality.

To sum up, improving the service quality of airports is a systematic project that requires concerted efforts from infrastructure construction, intelligent application, green development, service process optimization and staff service awareness enhancement. The successful experiences of Beijing Daxing International Airport and Singapore Changi International Airport provide valuable reference for other airports. Future airports should take into account their own actual conditions and actively adopt and innovate these advanced concepts and practices, with a view to winning a competitive advantage in the global aviation industry and providing passengers with a more excellent travel experience.

## **4 Survey on the status and satisfaction of airport service quality**

### **4.1 Overview of Chongqing Jiangbei International Airport**

#### **4.1.1 Introduction to Chongqing Jiangbei International Airport**

Chongqing Jiangbei International Airport (CKG), strategically positioned as a vital air transportation artery within the rapidly developing Southwest China region, has undergone a remarkable transformation to become a significant international aviation hub. Its establishment in 1990 marked a crucial step in enhancing the connectivity of Chongqing Municipality and its extensive hinterland, playing an increasingly pivotal role in facilitating both domestic and international passenger and cargo movement, thereby directly contributing to the region's sustained economic growth and its integration into the globalized world. The airport's developmental trajectory has been characterized by a series of substantial infrastructural expansions and continuous modernizations, most notably the phased construction of multiple state-of-the-art passenger terminals – Terminals T1, T2, and the expansive T3A – alongside significant upgrades to its airside and landside facilities, including the expansion of runway capacity to accommodate larger aircraft and increased flight frequencies, the implementation of advanced air traffic control systems to optimize airspace management, and the development of comprehensive ground transportation links to seamlessly integrate the airport with the city's broader transportation network.

The operational statistics of Chongqing Jiangbei International Airport provide compelling evidence of its escalating importance within the national and regional aviation landscape. According to data, the airport consistently ranks among the top ten busiest airports in mainland China in terms of passenger throughput (Wikipedia, 2025). In the pre-pandemic year of 2019, the airport handled over 44.7 million passengers, demonstrating its significant capacity and the substantial demand for air travel to and from the region (Xinhua, 2022). While the global pandemic in 2020 and subsequent years led to a temporary downturn in passenger numbers, Chongqing Jiangbei International Airport has demonstrated a strong recovery trajectory, with passenger traffic rebounding significantly, underscoring its resilience and the continued economic dynamism of the region it serves. Furthermore, the airport's cargo operations have also witnessed substantial growth, reflecting its increasing role in facilitating trade and logistics within Southwest China and beyond. The development of dedicated cargo handling facilities and the expansion of air freight routes highlight the airport's commitment to supporting the region's burgeoning industrial and commercial sectors.

Chongqing Jiangbei International Airport's geographical location positions it as a crucial gateway connecting Southwest China with other major economic centers within China and increasingly with international destinations across Asia, Europe, and beyond. The airport's extensive network of domestic and international flight routes provides vital connectivity for business travellers, tourists, and residents of the region, fostering economic activity, cultural exchange, and regional development. The ongoing efforts to expand international air links are a testament to the airport's ambition to become a more prominent player in the global aviation network, facilitating greater access to and from Southwest China for international trade, investment, and tourism.

In conclusion, Chongqing Jiangbei International Airport stands as a testament to the rapid development of Southwest China and its increasing integration into the global economy. Its substantial infrastructural development, consistently high passenger and cargo traffic volumes, strategic geographical location, and expanding domestic and international flight network underscore its critical role as a major aviation hub. The airport's ongoing commitment to modernization and expansion positions it as a key driver of regional economic growth and a vital gateway connecting Southwest China to the rest of the world.

#### **4.1.2 Chongqing Jiangbei Airport service quality development status**

Chongqing Jiangbei International Airport (CKG) is currently undergoing a multifaceted development aimed at improving the quality of its services, meeting the growing demand for passenger traffic and consolidating its position as a major international hub. These developments include infrastructure upgrades, technological advances and a commitment to improving the overall passenger experience at all touch points.

On the infrastructure front, CKG has been actively expanding its capacity to cope with growing passenger traffic. The construction of Terminal 3B and the fourth runway, which is expected to be operational by the first quarter of 2025, is an important step in this direction. According to CKG General Manager Hou Wei, this expansion will allow the airport to reach 80 million passengers per year, 1.2 million tons of cargo, and 580,000 aircraft movements (Casey, 2024). This infrastructure enhancement is critical to easing congestion and improving passenger flow at the airport, and it can directly impact the perceived quality of service by minimizing wait times and ensuring smoother movement.

Technological advances also play a key role in improving service quality at airports. The implementation of intelligent travel screening systems, including contactless temperature detection, radiation

monitoring and automatic passenger information recognition, has streamlined health and quarantine procedures. Baggage checkpoints equipped with advanced pre-screening X-ray machines and high-speed CT scanners, combined with remote image analysis systems, help speed up the baggage handling process and improve efficiency. In addition, the deployment of smart screening equipment at customs checkpoints, additional carry-on baggage lanes and portable translation equipment are designed to speed up the clearance of international travellers, a key aspect of service quality for a growing international hub (TAN, 2025). The airport is also committed to enhancing the overall passenger experience through various initiatives. The airport is committed to optimizing passenger flow through infrastructure design and smart system deployment. Measures such as encouraging the use of self-service check-in and baggage check-in machines, QR code flight confirmations, and self-service customs clearance aim to provide passengers with more travel options and greater autonomy (ACI, 2020).

Chongqing Jiangbei International Airport has also been recognized for its service quality in the past. It has been recognized as an “Outstanding Civil Airport in China's Service Quality Measurement” and has won the ASQ Program's “Asia-Pacific Best Ambience Award” and “Asia-Pacific Best Customer Service Award” for two consecutive years (Li, 2020). However, with the improvement of travellers' living standards and the increase of their needs, the service quality of airports does not meet the service standard requirements of all people, and there are still a lot of shortcomings, which need to be updated and improved with the development of the times in order to stabilize the position of airports in the market.

## **4.2 Investigation design and implementation**

### **4.2.1 Research method**

Questionnaire survey method is a widely used method in the field of social research at home and abroad, which has significant advantages in terms of clarity, reliability and scientifiability. Compared with the traditional interview method, the data collection process of questionnaire survey method is more systematic, comprehensive and controllable. This research on passenger service quality improvement strategies at Chongqing Jiangbei Airport adopts the questionnaire survey method to ensure the structural and empirical nature of the study. The main purpose of the questionnaire survey is to provide the information needed for management decisions to meet the information needs of decision makers. This questionnaire aims at the main purpose of this study: under the premise that the public has diversified and individualized needs for the public services provided by civil aviation airports, the questionnaire is designed based on the public's needs to understand

the current situation of the public's demand for airport public services, including airport infrastructure services, airport public transportation services, etc., and to find out the gaps between the public's expectations of the public services and the services that the public actually feels through the questionnaire results. Through the results of the questionnaire, the gap between the public's expectations of public services and the actual experience of the services, to find the problems and reasons for the supply of public services in Chongqing Jiangbei Airport, and based on this, to put forward the corresponding constructive suggestions. This paper combines the actual situation of Chongqing Jiangbei Airport with the two dimensions in the ASQ evaluation standard, and utilizes the five dimensions of the SERVQUAL model - perceivability, reliability, responsiveness, assurance and empathy - to design the questionnaire, collect the current situation of the service quality and the problems of Chongqing Jiangbei Airport, and analyze and test the research data. analyzed and tested. This method is conducive to obtaining detailed first-hand information, thus enhancing the authenticity and relevance of the information. In addition, the structured nature of the questionnaire increases the likelihood of a higher response rate and allows for a more precise and objective analysis of the findings, which ultimately contributes to a more in-depth and accurate understanding of service quality issues at the airport.

#### **4.2.2 Investigation tool**

This study uses the Chongqing Jiangbei Airport Passenger Service Quality Satisfaction Questionnaire (see Appendix 1 for the questionnaire) as the survey instrument, which is mainly based on the SERVQUAL scale in Chapter 2.1.2. The questionnaire is divided into two parts, which are the basic information and the service quality model based on the SERVQUAL model. The service quality model based on the SERVQUAL model consists of tangibility, reliability, responsiveness, assurance and empathy, and these five abstract dimensions are materialized into 30 questions in combination with the actual situation of Chongqing Jiangbei Airport. During the questionnaire design process, this study fully considered the comprehension ability of travellers with different educational backgrounds to ensure the accuracy and validity of the survey results. Based on the objective of public satisfaction with public services at civil aviation airports, the questionnaire is expressed in simple and easy-to-understand everyday language, avoiding the use of technical terms or complex expressions. By transforming the concept of service quality into the description of the service scene that passengers actually contact, the questions are closer to the real perception of passengers. At the same time, a uniform scale scoring model was adopted for the question options to reduce the cognitive burden in the answering process. Through the optimization of expression and logical verification in the pre-survey stage, we further ensure that the questions are clearly directed

and the options are clearly differentiated to minimize the response errors caused by language comprehension bias, and to provide a reliable data basis for the formulation of strategies to improve the service quality of airports. In the processing of data and statistics, this study collects and organizes the original questionnaire data and inputs them into Microsoft Excel software to build a file, and after checking the information, the reliability and validity analysis is carried out by using SPSSAU statistical software.

#### 4.2.3 Questionnaire data sources

This questionnaire survey was conducted in the mode of online + offline survey, and the offline research location was Chongqing Jiangbei International Airport. The target of the questionnaire survey in this paper is Chongqing Jiangbei Airport passengers. The survey was conducted offline by distributing and collecting questionnaires (Appendix 1), and online and offline by using the QR code of "Questionnaire Star". The questionnaire was administered from March 15, 2025 to April 15, 2025. A total of 230 questionnaires were distributed online and offline, and 213 questionnaires were actually collected, of which 200 were valid questionnaires, with a recovery rate of 87%.

### 4.3 Survey results

#### 4.3.1 Reliability Analysis of the Survey Instrument

Reliability analysis is a fundamental step in validating a survey instrument, as it evaluates the internal consistency of the questionnaire items that are intended to measure the same construct. A reliable survey ensures that the results obtained are stable and consistent across different administrations and respondents. In the context of service quality assessment at airports, ensuring high reliability is essential to guarantee that the measured constructs—such as tangibility, reliability, responsiveness, assurance, and empathy—accurately reflect passengers' experiences and perceptions.

To evaluate the internal consistency of the questionnaire, Cronbach's alpha coefficient was employed. Cronbach's alpha ( $\alpha$ ) is one of the most widely used reliability statistics, which quantifies how closely related a set of items are as a group. Generally, a Cronbach's alpha value of 0.7 or above is considered acceptable, with higher values indicating better reliability. Additionally, Corrected Item-Total Correlation (CITC) values were used to assess the contribution of each item to its corresponding dimension. A CITC value above 0.3 is typically regarded as acceptable, while values above 0.5 indicate strong item relevance. Moreover, the "Cronbach's alpha if item deleted" column allows for the examination of how the removal of a particular item would affect the overall reliability of its dimension. **Table 3** below demonstrates the Cronbach's alpha reliability analysis results of the questionnaire.

**Table 3.** Cronbach  $\alpha$  reliability analysis results

Dimension	Question	CITC	Cronbach $\alpha$ if Item Deleted	Cronbach $\alpha$
Tangibility	Satisfaction with seating availability and comfort	0.471	0.707	0.741
	Perception of airport's environmental and green design	0.387	0.728	
	Satisfaction with self-service equipment availability	0.493	0.700	
	Clarity and usability of signage and mobile navigation	0.422	0.721	
	Timeliness and accuracy of flight information	0.507	0.696	
	Efficiency and accuracy of baggage claim	0.588	0.672	
Reliability	Consistency of services under different passenger volumes	0.492	0.753	0.778
	Airport's reliability during delays or unexpected events	0.523	0.745	
	Response effectiveness when assistance is needed	0.524	0.745	
	Accessibility of service points	0.512	0.748	
	Speed and usability of digital platforms	0.512	0.748	
	Responsiveness of staff in peak/emergency situations	0.596	0.730	
Responsiveness	Professionalism of airport staff	0.530	0.734	0.771
	Standardization of service procedures (check-in, security, inquiries)	0.536	0.732	
	Confidence in service process consistency and quality	0.554	0.728	
	Trust in the airport's ability to improve service quality	0.424	0.760	
	Accommodation of diverse passenger needs	0.526	0.735	
	Comprehensiveness of services for special groups	0.525	0.735	
Assurance	Satisfaction with cultural and leisure environment	0.535	0.747	0.782

Dimension	Question	CITC	Cronbach $\alpha$ if Item Deleted	Cronbach $\alpha$
	Access to support during urgent situations	0.544	0.745	
	Cleanliness and hygiene of terminal facilities	0.529	0.749	
	Overall tidiness and appearance of airport areas	0.379	0.782	
	Availability of basic public amenities (toilets, water, rest areas)	0.578	0.737	
	Perceived energy efficiency of lighting and air systems	0.610	0.728	
	Accessibility and distribution of carbon footprint visualization	0.518	0.726	
	Visibility and accessibility of emergency exits and safety instructions	0.525	0.724	
	Ease of moving through the terminal (elevators, walkways)	0.449	0.743	
Empathy	General security checks perceived as efficient and non-disruptive	0.450	0.742	0.763
	Waiting lines in security or boarding process well-managed	0.572	0.711	
	Level of ambient noise and overall acoustic comfort	0.520	0.725	

**Table 4.** Cronbach  $\alpha$  reliability analysis results

Based on the results shown in the reliability analysis table, the CITC values for the six items in the tangibles dimension (from 0.387 to 0.588) are acceptable. The overall Cronbach's alpha value is inferred to be above 0.7, and deletion of any of the individual items does not significantly increase the value, suggesting that the items are able to consistently measure the tangibility of airport services.

For the items in the reliability dimension, they show strong internal consistency with CITC values between 0.492 and 0.596. The "Cronbach alpha" values when items were removed were all close to the actual alpha value of the dimension, indicating that each item contributed meaningfully to the dimension without redundancy or noise.

Similar to the previous dimensions, the responsiveness items all had CITC values above 0.42, and if the items were deleted, the Cronbach alpha values were below 0.76. Although one item (“trust in the airport's ability to improve the quality of its services”) had a slightly lower CITC value (0.424), it still exceeded the acceptability threshold, indicating a moderate contribution to this dimension. Overall, the reliability of the responsiveness items is satisfactory.

The Assurance dimension also shows acceptable internal consistency. the CITC values vary widely (0.379 to 0.610), with one item (“Overall neatness and appearance of the airport area”) close to borderline in terms of acceptability. Nonetheless, the construction of the dimension remains reliable as the Alpha value increases only slightly with the deletion of this item.

The items in the empathy dimension showed good consistency, with all CITC values above 0.44 and the alpha value after deletion of the item remaining below 0.75. This suggests that the scale is balanced and internally consistent, reflecting passengers' perceptions of personalized service and care.

The results of the Cronbach's alpha reliability analysis indicate that the questionnaire has acceptable internal consistency across all five dimensions. All CITC values were within or above the acceptable range, and Cronbach's alpha values were generally above the critical value of 0.70, which indicates that the questionnaire is suitable for use in measuring perceptions of airport service quality. These results demonstrate the reliability of the instrument and its potential for effective application in passenger satisfaction assessment and service improvement programs.

#### **4.3.2 Validity Analysis of the Survey Instrument**

Validity analysis plays a vital role in assessing whether a questionnaire accurately measures the intended constructs. In the context of airport service quality evaluation, ensuring validity is crucial for drawing meaningful and trustworthy conclusions about passenger satisfaction. Construct validity—how well a set of items represents the theoretical dimensions—is particularly important when designing multi-item scales. Two key statistical tools commonly employed to assess the appropriateness of factor analysis, and hence construct validity, are the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity.

The KMO measure evaluates the proportion of variance among variables that might be common variance (i.e., shared between underlying factors). KMO values range from 0 to 1, with values above 0.7 generally considered acceptable, and values above 0.8 indicating meritorious suitability.

for factor analysis. A value of 0.753, as obtained here, suggests a moderate to good level of sampling adequacy, meaning the data is appropriate for structure detection via factor analysis.

Bartlett's Test of Sphericity assesses whether the correlation matrix significantly differs from an identity matrix (in which variables are uncorrelated). A significant test result indicates that there are meaningful relationships among variables, justifying the use of factor analysis. In the KMO and Bartlett's test results for the questionnaire shown in **Table 5** below, the test yielded a Chi-square value of 1524.166 with 435 degrees of freedom, and a p-value of 0.000. This highly significant result confirms that correlations exist among the variables and supports the validity of applying factor analysis to the dataset.

**Table 5.** KMO and Bartlett tests

Kaiser-Meyer-Olkin (KMO) Value		0.753
Approx. Chi-Square		1524.166
Bartlett's Test of Sphericity	Degrees of Freedom (df)	435
<i>p</i> -value		0.000

The results of the validity analysis demonstrate that the questionnaire has a statistically acceptable structure for exploratory or confirmatory factor analysis. The KMO value of 0.753 indicates that the dataset has sufficient sampling adequacy, and the significant Bartlett's Test result ( $p < 0.001$ ) affirms the presence of substantial correlations among the survey items. Together, these findings suggest that the questionnaire exhibits good construct validity and is appropriate for further multivariate statistical analysis aimed at uncovering latent dimensions of airport service quality perception.

#### 4.3.3 Descriptive Statistical Analysis

The descriptive statistical analysis of the respondents' demographic and travel-related characteristics provides valuable context for interpreting the results of the satisfaction survey. This foundational information provided in Table 4 helps to understand the composition of the survey sample and ensures that the data reflect the diverse experiences and perspectives of passengers.

**Table 6.** Descriptive statistics of questionnaire samples

Category	Option	Frequency	Percentage (%)
Gender	Male	112	56.0%
	Female	87	43.5%
	Other / Prefer not to say	1	0.5%
Age Group	Under 18	6	3.0%
	18–30	78	39.0%
	31–45	59	29.5%
	46–60	35	17.5%
	Above 60	22	11.0%
Travel Purpose	Business	62	31.0%
	Leisure / Tourism	92	46.0%
	Visiting Friends / Relatives	34	17.0%
	Other	12	6.0%
Travel Frequency	First-time traveller	17	8.5%
	Occasionally (1–2 times per year)	83	41.5%
	Regularly (3–5 times per year)	61	30.5%
	Frequently (More than 5times/year)	39	19.5%
Travel Type	Domestic flight	143	71.5%
	International flight	57	28.5%

Gender distribution reveals a relatively balanced sample, with 56.0% male respondents ( $n = 112$ ) and 43.5% female respondents ( $n = 87$ ). A very small fraction, 0.5%, identified as “Other” or preferred not to disclose their gender. This indicates that the survey reached a wide gender demographic with only minimal non-response in this category.

In terms of age, the largest proportion of participants fell into the 18–30 age group (39.0%), followed by 31–45 (29.5%), and 46–60 (17.5%), while those above 60 years old accounted for 11.0%, and respondents under 18 constituted 3.0%. This distribution suggests a good representation of adult passengers, particularly those in their early to mid-career stages, which aligns with typical air travel demographics.

Regarding travel purpose, the data shows that leisure or tourism was the primary reason for travel for 46.0% of the respondents, followed by business travel (31.0%), and those visiting friends or relatives (17.0%). A smaller segment (6.0%) traveled for other unspecified purposes. This suggests that both personal and professional motivations for travel were well represented.

Travel frequency statistics indicate that the sample includes a mix of experience levels. The largest group traveled occasionally (1–2 times per year, 41.5%), followed by regular travellers (3–5 times per year, 30.5%), and frequent travellers (more than 5 times per year, 19.5%). Only 8.5% were first-time travellers, indicating that most participants had prior experience with air travel and airport services, which lends credibility to their evaluations.

Lastly, in terms of travel type, a significant majority (71.5%) traveled on domestic flights, while 28.5% took international flights. This reflects a strong domestic travel component, though international travel was also substantially represented, allowing for insights across both types of travel environments.

In summary, the demographic and behavioral characteristics of the respondents indicate a well-distributed and diverse sample, with adequate representation across gender, age, travel purpose, frequency, and flight type. This diversity enhances the generalizability and relevance of the survey findings in assessing airport service satisfaction.

#### **4.3.4 Current Situation of Service Satisfaction in Chongqing Jiangbei Airport**

The statistical results of the Chongqing Jiangbei International Airport service quality satisfaction survey offer a comprehensive overview of passenger perceptions across various service dimensions. **Table 7** below shows the results of the satisfaction questionnaire. The mean scores for the 30 survey items suggest an overall favorable evaluation of airport services, although some areas indicate room for targeted improvement.

**Table 7.** Questionnaire survey data of passenger service satisfaction

No.	Survey Question Summary	Mean Score
1	Satisfaction with seating availability and comfort	3.98
2	Perception of airport's environmental and green design	3.98
3	Satisfaction with self-service equipment availability	3.965
4	Clarity and usability of signage and mobile navigation	3.99
5	Cleanliness and maintenance of the airport	4.655
6	Availability and condition of baggage trolleys	4.625
7	Timeliness and accuracy of flight information updates	4.135
8	Accuracy and waiting time in baggage claim	4.135
9	Service consistency under different passenger volumes	4.115
10	Reliability in handling flight delays or unexpected events	4.13
11	Availability and stability of free Wi-Fi	4.71
12	Reliability of shuttle buses between terminals and parking areas	4.76
13	Responsiveness and effectiveness of help when assistance is sought	3.99
14	Ease of finding service points and getting help	4.085
15	Responsiveness and user experience of digital services (app, WeChat, etc.)	4.075
16	Responsiveness and support during peak periods or emergencies	4.06
17	Promptness of assistance for mobility aid requests	4.595
18	Availability and satisfaction with multilingual staff	4.605
19	Professionalism of staff in service attitude, communication, and skills	4.095
20	Orderliness and standardization in core service processes	4.065
21	Confidence in the consistency and quality of service processes	4.13
22	Trust in the airport's ability to improve service quality	4.09
23	Clarity and audibility of safety announcements and boarding calls	4.62
24	Clarity and audibility of safety announcements and boarding calls	4.585

No.	Survey Question Summary	Mean Score
25	Clarity and audibility of safety announcements and boarding calls	3.94
26	Clarity and audibility of safety announcements and boarding calls	4
27	Cultural and aesthetic experience of the waiting environment	4.005
28	Ability to quickly receive support during urgent situations	3.945
29	Availability and comfort of nursing/mother's rooms	4.475
30	Provision of children's play areas or family rest zones	4.46

**Table 8.** Questionnaire survey data of passenger service satisfaction

The Tangibles dimension reveals a nuanced passenger reaction to Chongqing Jiangbei's physical environment. While core facility maintenance such as cleanliness and baggage trolley availability receives very high satisfaction (means of 4.655 and 4.625, respectively), more basic comfort and wayfinding elements linger just below full approval, with seating comfort, green-design perception, self-service equipment usability, and signage clarity all averaging narrowly under 4.0 (3.965–3.99). This pattern indicates that although visible upkeep and essential hardware meet expectations, the more experiential aspects of spatial design—ergonomic seating, intuitive kiosk interfaces, and multilingual, high-contrast wayfinding—fail to elevate passenger delight, signaling a need for targeted ergonomic and digital enhancements.

In the Reliability dimension, routine operational metrics yield moderate yet consistent satisfaction. Flight-information updates and baggage claim performance both average 4.135, service consistency under varying passenger volumes is 4.115, and reliability in handling unexpected events scores 4.13. However, system-critical supports—namely free Wi-Fi and shuttle-bus reliability—stand out with means of 4.71 and 4.76, demonstrating that passengers particularly value uninterrupted connectivity and dependable terminal transport. These results suggest that while foundational processes operate competently, infrastructural investments in intelligent scheduling and real-time monitoring could further stabilize the broader reliability ecosystem.

Passengers' perceptions of Responsiveness underscore a similar dichotomy between general and specialized assistance. General help-desk responsiveness and digital-service usability average around 4.00 (means of 3.99 to 4.075), reflecting adequate but improvable first-line support and interface design. By contrast, assistance for mobility-aid requests and availability of multilingual staff score substantially higher (4.595 and 4.605), indicating that dedicated, tailored services for vulner-

able and international travelers are executed with commendable speed and empathy. This divergence highlights an opportunity to extend the proactive, specialized responsiveness seen in these targeted services to the broader passenger support channels.

Within the Assurance dimension, staff professionalism, procedural standardization, and confidence in continuous improvement garner solid ratings in the 4.065–4.13 range, suggesting that passengers perceive staff competence and process reliability as satisfactory but not exceptional. More critical safety-related elements—clarity of safety announcements and the visible presence of security personnel—achieve higher satisfaction (means of 4.62 and 4.585), emphasizing the importance of clear communication and physical security measures in fostering traveler confidence. Together, these data imply that while staff training and SOP enforcement are broadly successful, enhanced scenario-based drills and real-time quality audits could raise the overall consistency of professional assurance.

Finally, the Empathy dimension displays a split between general inclusivity measures and dedicated family-oriented amenities. Consideration for diverse passenger needs and special-group services average just under 4.0 (3.94 and 4.00), indicating moderate success in broad accessibility initiatives. In contrast, nursing/mother's rooms and children's play areas score strongly at 4.475 and 4.46, reflecting passengers' high appreciation for purpose-built family support spaces. Cultural and aesthetic experiences, alongside emergency support responsiveness, also cluster around 4.0, revealing that while bespoke family services excel, more comprehensive personalization—such as localized cultural exhibitions and real-time empathetic communications—could further enhance the airport's human-centered appeal.

In conclusion, while Chongqing Jiangbei International Airport performs strongly in specific areas such as environmental cleanliness, mobility assistance, shuttle service reliability, and family-oriented amenities, the survey results reveal opportunities for improvement in broader experiential and inclusive aspects. Elements such as seating comfort, wayfinding clarity, general help-seeking responsiveness, and universal design for diverse passenger needs show room for enhancement.

## **5 Analysis of service quality problems in Chongqing Jiangbei Airport**

After conducting a questionnaire survey on passenger service quality satisfaction at Chongqing Jiangbei Airport, it was found through data aggregation and qualitative generalization that there are different degrees of problems in the five core dimensions of service quality: tangibility, reliability, responsiveness, assurance and empathy. These problems constrain the improvement of the over-all service image of airports, and to a certain extent affect the subjective satisfaction and repeated use willingness of travellers. The following section analyzes the main service problems in each of the five dimensions to provide a basis for the development of subsequent strategies and recommendations.

### **5.1 Tangibility deficiencies and the need for smart, green infrastructure**

Passenger evaluations suggest that while basic cleanliness and utility infrastructure at Chongqing Jiangbei Airport are adequately maintained—with 65.5 % “Very Satisfied” with sanitation and 62.5 % with trolley availability—some core physical environment elements fall short in enhancing passenger comfort and spatial orientation. For instance, only 10.5 % of respondents express high satisfaction with public seating, and merely 11.5 % with the clarity of directional signage, indicating deficiencies in ergonomic planning and spatial communication. Neutral feedback (12.5 % on both items) points to a lack of consistent visual guidance and intuitive layouts. Ancillary facilities such as power supply points and quiet zones are inconsistently distributed, which not only causes inconvenience but also disrupts group travel coordination. Further, passengers mention limited access to user-friendly terminals and a noticeable absence of visible sustainability cues within the airport space, which may reflect underdeveloped integration of user experience design and environmental transparency into infrastructure development strategies.

### **5.2 Operational reliability gaps and the imperative for integrated, predictive control**

Despite generally positive perceptions of core operations—such as approximately 74 % of passengers being “Satisfied” with flight information and baggage handling—a deeper look reveals challenges under dynamic or high-volume conditions. Notably, only around 20 % report strong confidence in these services. Passengers have recounted experiences involving last-minute gate changes and delayed baggage without sufficient updates, suggesting that communication mechanisms during disruptions remain insufficiently proactive. These inconsistencies likely stem from the absence of a fully integrated and predictive information management system capable of harmoniz-

ing inputs from multiple operational entities. Furthermore, the lack of automation and real-time decision support tools within ground services contributes to variability in service quality, particularly during peak times, creating a sense of unreliability for travellers under pressure.

### **5.3 Inadequate response capacity**

In terms of staff and system reactivity, the airport performs unevenly. While services for mobility assistance and multilingual communication achieve relatively high “Very Satisfied” ratings (59.5 % and 60.5 %, respectively), there is markedly lower satisfaction (14 %) with information counter support and with digital interactions (only 8.5 % “Very Satisfied”), suggesting a service gap for general inquiries and self-service platforms. Many users express frustration with being redirected across departments or having to repeat queries through different channels, highlighting procedural fragmentation. This fragmentation may be attributed to a lack of centralized coordination across passenger-service interfaces and insufficient empowerment or training of frontline staff to resolve multifaceted issues independently. During events requiring coordinated action—such as delays or sudden weather disruptions—support timeliness and clarity appear inconsistent, further reinforcing perceptions of insufficient responsiveness.

### **5.4 Assurance weaknesses and the requirement for standardized training and external certification**

Confidence in the airport’s overall service execution is moderate: though 80 % and 75.5 % are “Satisfied” with improvement efforts and procedural standardization respectively, the proportion of highly confident passengers remains limited (14.5 % and 15.5 % “Very Satisfied”). This suggests latent doubts regarding the consistency and professionalism of service delivery. Observations from travellers indicate that staff, while capable of managing routine tasks, may not be equally prepared to address unexpected or complex situations. This imbalance could result from a training structure that emphasizes basic procedures over scenario-based skill development, coupled with a lack of performance-tracking tools that capture frontline adherence to service protocols in real time. Moreover, without regular third-party evaluations or feedback-driven quality audits, there is limited external validation of service reliability, leaving gaps in the perception of assured and consistent care.

### **5.5 Empathy deficiencies and the call for personalized, culturally rich passenger care**

Passenger experiences in the realm of empathy indicate partial fulfillment of expectations. While basic family-oriented amenities such as children’s zones and nursing rooms garner favorable responses (48–54 % “Very Satisfied”), other elements—such as cultural ambiance and urgent inter-terminal support—see more modest approval (around 12–15 % “Very Satisfied” and up to 14.5 %

neutral). Beyond standard facilities, travellers note a lack of emotionally resonant features or gestures that personalize their journey—such as dynamic cultural storytelling, real-time wayfinding assistance for first-time travellers, or proactive help for vulnerable individuals. The limited interactivity and static nature of cultural installations may indicate missed opportunities to engage diverse passenger segments on a deeper emotional level. Additionally, the absence of a structured mechanism to detect and preemptively support individuals with specific needs suggests that current empathy-related services may be reactive rather than anticipatory, potentially due to the lack of data-informed service customization frameworks.

In summary, Chongqing Jiangbei Airport has structural and implementation shortcomings in several service quality dimensions. The existence of these problems not only affects the travel experience of passengers, but also weakens the brand image of the airport to a certain extent. In view of the above problems, it is necessary to combine systematic data analysis and user perception evaluation to formulate a multi-dimensional synergistic optimization strategy, from hardware updating, process modification to service concept change, to achieve a comprehensive upgrade of service from “usable” to “palpable”.

## 6 Proposed strategies and suggestions

### 6.1 Tangibility

For Chongqing Jiangbei Airport, although as an important aviation hub in the central and western regions, it has certain advantages in terms of infrastructure, more modern terminal design, and relatively reasonable spatial distribution, but there are still some functional areas with poor experience, insufficient space utilization, and mismatch between aging equipment and people flow management. Therefore, to improve the “tangibility”, we should focus on the optimization of space structure and the humanization of detailed facilities, and gradually build a physical environment with both efficiency and temperature.

First of all, regarding the functional division and facility layout of the waiting area, it is recommended to strengthen the environmental comfort design of high-density use areas such as rest areas and boarding gates. On the one hand, increase the number of rest seats and adopt ergonomic design to enhance passenger experience; on the other hand, optimize the spatial layout to avoid the intersection of the rest area and the main corridor of the passenger flow, so as to enhance the use efficiency and privacy. At the same time, more humanized ancillary facilities should be equipped, such as cell phone charging ports, reading lamps, children's activity areas and barrier-free auxiliary equipment, so as to enhance the convenience and diversity of the waiting experience.

Secondly, improving the setting of the indication system and the form of information display is the key to improve the efficiency of airport navigation and spatial perception. At present, Jiangbei Airport has problems such as unclear signage and confusing information layout, which cause passengers to lose their way or repeatedly ask questions in the terminal building. It is recommended to set up multi-language high-contrast signs at important nodes (such as security checkpoints, boarding gates, baggage claim, etc.), supplemented by electronic dynamic information screens, combined with voice broadcasting and image navigation systems, to build a multi-modal, intelligent passenger guidance system. In addition, the use of cell phone APP to provide map navigation and positioning services can also effectively enhance the ability of independent navigation.

Further, the modernization level of airports is largely reflected in the perceivability and participation of their green facilities. To this end, it is recommended that a carbon footprint visualization system be established to enhance travellers' intuitive understanding of the airport's operational processes and the carbon emissions of their personal behaviors. Through interactive terminals or electronic screens, the system can display the carbon emission data involved in flight takeoffs and landings,

waiting activities, transportation connections, etc., and set up a simple carbon footprint calculation function for travellers to assess the environmental impact of their travel modes. Through dynamic data display and friendly image interaction, it not only conveys the concept of green operation of airports, but also helps to guide the public to form an awareness of environmental protection, and enhances travellers' comprehensive evaluation of the social responsibility and service quality of airports.

At the same time, it is recommended to establish an energy-saving facility layout plan to promote the development of various airport operating equipment in the direction of high energy efficiency and intelligence. At present, excessive lighting and redundant air-conditioning loads in some areas of Jiangbei Airport reflect inadequate management of energy use and the urgent need to improve operational efficiency through technical means. It is recommended to introduce a zoning control mechanism for lighting and ventilation systems based on the passenger flow model, combining LED lamps, intelligent sensing systems and time regulation strategies to build an energy-efficient lighting and temperature control network. In addition, solar photovoltaic systems, green roofs and rainwater recycling facilities can be installed in suitable areas of the terminal building to realize self-cycling of energy and reduce the carbon intensity of the overall operation. The systematic deployment of energy-saving facilities not only improves the operational efficiency of the hardware, but also helps the airport to realize the goal of sustainable development.

## **6.2 Reliability**

In recent years, Chongqing Jiangbei Airport has steadily improved its flight punctuality rate and continuously optimized its operational efficiency, but it has still revealed certain uncertainties in extreme weather, baggage handling and passenger information delivery, which affects the overall consistency of service and passenger satisfaction. Therefore, to improve reliability, it is necessary to start with the intelligent construction of the operation mechanism, promote multi-party linkage and information integration, and realize efficient control of the operation process and rapid response under abnormal conditions.

Currently, when flight scheduling faces unexpected weather or airspace restrictions, the proportion of relying on manual coordination and empirical judgment is still high, and there is a time gap between prediction and response, resulting in longer waiting time for passengers (Cook et.al 2019, 250). It is recommended to establish a flight delay warning model relying on multi-source data fusion technology, and realize the system to automatically identify potential delay risks and push warning instructions by integrating real-time information from air traffic control, meteorology, air-

lines and other departments, with the automated linkage of boarding gates, shuttle buses, broadcasting systems and other service facilities, to improve the efficiency of synchronizing passengers' information, and to reduce dissatisfaction due to the lagging of information.

In terms of baggage transportation, some passengers' complaints about damaged, delayed or misdirected baggage are still concentrated, indicating that there is still room for improvement in the current checked baggage tracking system. It is recommended to upgrade to RFID baggage tracking system to realize the digital management of the whole process from check-in to pick-up. By attaching a unique electronic tag to each piece of checked baggage and installing sensor equipment at key nodes such as conveyor belts, loading and unloading, a visual monitoring system is established, which not only facilitates real-time positioning in the background, but also displays the status of the baggage in real time through the APP on the passengers' side, enhancing the passengers' sense of control and trust.

In addition, the basis for improving operational reliability lies in the construction of a scientific decision support system. It is recommended to set up an operation data center in the airport management platform, integrating multi-dimensional data such as flight scheduling, passenger flow, equipment operation, customer service response, etc., and presenting the key operation indexes through the visualization dashboard. Managers can rely on this to conduct trend research and judgment, identify bottlenecks and deploy emergency resources, and transform from passive response to active governance, so as to build a more stable, efficient and predictable operation mechanism.

### **6.3 Responsiveness**

Chongqing Jiangbei Airport already has a basic response mechanism for customer service hotlines and on-site inquiries, but there is still significant room for improvement in peak response speed, closed-loop quality of service, and online and offline coordination. Therefore, the enhancement of responsiveness should focus on the integration and construction of multi-channel response platforms, strengthen intelligent support, and improve the continuity and synergy of services.

Currently, travellers get information through WeChat, telephone hotlines, on-site inquiries and other channels, but in the face of complex needs or emergencies, the information chain is often broken, leading to the phenomenon of "repeated transfers" or "no one to follow up". It is proposed to integrate the resources of various service entrances, establish a unified service hub platform, and realize the information interoperability among customer service, security, ground handling,

property and other departments. All travellers initiated the problem request will automatically generate task number, according to the priority classification distributed to the specific responsible person, and real-time tracking of processing progress in the background, to ensure that each problem has a response, processing, and a return visit.

At the same time, to enhance the ability of travellers to solve problems on their own is also particularly critical. In the terminal building, a number of intelligent service terminals can be installed to support multi-language, equipped with voice recognition and touch operation, providing flight dynamics, navigation guidance, emergency handling and other common functions. The terminals can be bound to the identity of passengers to realize personalized information delivery. For example, when flights are delayed, it automatically recommends available rest cabins, booking high-speed trains on behalf of passengers and other options, realizing the transformation of service from “passive response” to “active prediction”.

In addition, when responding to major passenger problems or large traffic disturbances, the traditional mode of relying on scheduled services often lags in response (Coolen & Wegen 2007, 294). It is proposed to set up a flexible deployment of “fast response service team”, composed of multi-position composite personnel, with the help of positioning system and wireless communication, to realize on-demand dispatch and response in the vicinity. By building a service system of “response integration, data linkage and closed-loop process”, the trust and satisfaction of passengers can be further enhanced.

#### **6.4 Assurance**

In airport operations, it is not only reflected in the service quality of the staff, but also in the standardization of the service process, the scientific nature of the evaluation and the transparency of the management. Chongqing Jiangbei Airport has a certain foundation in front-line staff training and safety management, but there are still areas to be strengthened in the distribution of staff competence levels, service operation standards, supervision and feedback mechanisms, etc. To enhance the assurance of systematic optimization around the training system, process standards and supervision mechanisms.

First of all, in terms of staff training, the existing training mode is based on pre-service learning and job rotation training for new employees, with relatively fragmented content and lack of relevance and practical combination. It is recommended to build a comprehensive training system of “job stratification, module grading”, and customize the content of service etiquette, safety and emer-

gency response, language communication, psychological identification, etc. according to the function and depth of the job, combined with situational exercises and case review for practical enhancement. At the same time, we set up an online learning platform and a training points mechanism to realize continuous learning and dynamic tracking of competence.

Secondly, the key to improve service assurance lies in the establishment of an executable and assessable standardized process system. It is recommended to formulate service operation SOPs for core links such as check-in, security check, guidance and inquiry, and embed them in the information system to realize the process of leaving traces. Each service node can track operators, processing time and passenger feedback through the backstage system to realize traceable responsibility and controllable problems. At the same time, the service process is linked to performance appraisal, forming a closed-loop mechanism of “standardization for implementation and appraisal for optimization”.

Finally, in order to ensure the continuous improvement of service quality, it is necessary to introduce a dual-wheel drive mechanism of external evaluation and internal audit. It is recommended to accept international service quality system certifications such as ACI ASQ on a regular basis to obtain independent evaluation indexes; meanwhile, through the third-party mystery shopper mechanism, unannounced sampling inspections of the service process will be conducted and the problems found will be categorized into quality improvement plans. The construction of two-way feedback will effectively enhance staff alertness and standardized execution, providing travellers with a consistent professional experience.

## **6.5 Empathy**

Currently, Chongqing Jiangbei Airport has achieved initial results in barrier-free facilities, mother and baby services and special passenger care, but the active identification of passengers' diversified needs and differentiated service responses are still insufficient. Further enhancement of empathy requires deeper efforts in personalized service, cultural identity and social care to truly realize the “people-oriented” service concept.

In order to more accurately understand the needs of passengers, we can consider building a service recommendation system based on passenger profiles. The system can automatically identify different types of users such as the elderly, children, pregnant women, business travellers, etc., and recommend the most suitable rest areas, check-in lanes, boarding time reminders and other services for them through the multi-dimensional establishment of service profiles based on passen-

gers' identity information, historical travel behavior, and membership data. Before passengers arrive at the airport, customized service tips can be sent via APP or SMS to achieve early intervention and accurate reach of services.

Meanwhile, creating a service atmosphere with local cultural characteristics is an important means to enhance empathy (Halpern and Mwesiumo 2021, 100667). It is recommended that Chongqing regional cultural elements be integrated into the waiting area and channel area, such as setting up Hongyadong antique landscape display, non-legacy craft interactive experience area, etc., so that travellers can get a sense of cultural immersion while waiting for their flights. Local art performances and festival-themed flash mobs are regularly held, transforming the airport from a mere transportation node into a showcase of the city's image and enhancing passengers' sense of belonging and emotional connection.

In addition, the establishment of an exclusive service mechanism for special travellers should not be ignored. It is recommended to expand the service scope of the "love channel" for the elderly, the disabled, pregnant women and other travellers to provide from the station to boarding "one-to-one" guidance services, the establishment of a dedicated escort mechanism and emergency green channel. And further improve the passenger assistance platform, and medical, public security, volunteer organizations to form a linkage system, in case of emergencies to provide immediate support and psychological comfort, to ensure that every special travellers can complete the trip smoothly and peacefully.

## 7 Conclusions and further research

### 7.1 Conclusions

This study presents a rigorous exploration of service quality enhancement strategies for Chongqing Jiangbei International Airport (CKG), synthesizing theoretical frameworks, empirical data, and global best practices to address the evolving demands of modern air travel. By integrating the SERVQUAL model with the Airport Service Quality (ASQ) program's smart and green indicators, the research advances a multidimensional evaluation framework tailored to the unique challenges of a regional aviation hub in Southwest China. The investigation reveals critical gaps across five service dimensions—tangibility, reliability, responsiveness, assurance, and empathy—while proposing innovative, context-sensitive solutions to elevate passenger satisfaction, operational efficiency, and sustainable development.

The analysis underscores the necessity of reimagining airport infrastructure and service delivery through a dual lens of technological innovation and human-centric design. While foundational elements such as cleanliness and procedural standardization meet baseline expectations, the study identifies systemic shortcomings in adaptive spatial planning, predictive operational controls, and personalized passenger engagement. For instance, the physical environment, though functionally adequate, lacks intuitive wayfinding systems and ergonomic amenities that cater to diverse traveler needs. Similarly, while core operational processes demonstrate moderate reliability, gaps in real-time communication during disruptions and fragmented service coordination highlight the urgency for integrated data platforms and AI-driven resource management. These findings align with broader industry trends emphasizing the convergence of digital transformation and sustainability in airport management.

The proposed strategies advocate for a holistic transformation of CKG's service ecosystem. Tangibility improvements focus on intelligent infrastructure upgrades, such as energy-efficient terminal redesigns augmented by interactive carbon-footprint visualization systems, which not only enhance passenger experience but also align with national green aviation goals. Reliability enhancements prioritize predictive analytics and blockchain-backed systems for flight delay management and RFID-enabled baggage tracking, ensuring seamless operations even under stress. Responsiveness is addressed through centralized omnichannel service hubs and dynamically allocated rapid-response teams, supported by AI-driven predictive assistance to preempt passenger needs. Assurance is strengthened via modular, scenario-based staff training programs and third-party quality audits, fostering consistency and professionalism. Empathy-driven initiatives, such as AI-powered

passenger profiling and culturally immersive installations showcasing Chongqing's heritage, aim to deepen emotional connections and inclusivity.

Theoretical contributions emerge from the novel integration of SERVQUAL's traditional dimensions with smart and green metrics, offering a scalable model for regional airports navigating the dual pressures of digitalization and environmental accountability. By contextualizing global benchmarks like Beijing Daxing's biometric systems and Singapore Changi's customer experience innovations, the study demonstrates how localized adaptations can bridge the gap between international standards and regional operational realities. Practically, the strategies provide a roadmap for CKG to transition from a transactional service provider to a transformative travel hub, fostering passenger loyalty, operational resilience, and regional economic vitality through enhanced tourism and logistics networks.

This research emphasizes the need for adaptive governance in airport management, advocating for continuous innovation, stakeholder collaboration, and data-driven decision-making. In an era where passenger expectations, environmental requirements, and digital disruption are intertwined to reshape the future of air travel, these findings will provide practical strategies for improving service quality at Chongqing Jiangbei Airport.

## **7.2 Limitations of the study and suggestions for future research**

While the findings provide a comprehensive diagnosis and strategic blueprint, the study has several limitations that suggest avenues for further inquiry. First, the cross-sectional survey captured passenger perceptions at a single point in time; longitudinal tracking would illuminate how satisfaction evolves in response to implemented improvements. Second, the reliance on self-reported questionnaire data may introduce response bias; future studies should incorporate qualitative interviews, observational audits, and system-generated usage logs to triangulate passenger feedback with behavioral insights. Finally, the smart and green indicators introduced here represent an initial foray into digital and environmental metrics; subsequent research might pilot emerging technologies—such as AI-driven predictive maintenance, biometric wayfinding, and real-time energy-management dashboards—and empirically assess their impact on passenger experience and resource efficiency. Addressing these limitations will deepen understanding of service-quality dynamics in airports and bolster the evidence base for sustainable, tech-enabled operational excellence.

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## Appendices

### Appendix 1.

#### Passenger Satisfaction Survey – Chongqing Jiangbei International Airport

Dear passenger,

Thank you for taking the time to participate in this survey. We are conducting a study to evaluate the service quality of Chongqing Jiangbei International Airport based on your travel experience. Your feedback is valuable and will help us better understand how passengers perceive airport services and identify areas for improvement.

This questionnaire is divided into two parts:

- **Part 1: Basic Information**, which helps us understand the background of respondents.
- **Part 2: Satisfaction Assessment**, which invites you to rate different aspects of the airport's services based on your experience.

Please be assured that all responses will remain strictly confidential and used solely for academic and service improvement purposes.

**For Part 2, please rate each item from 1 to 5:**

(1 = Very Dissatisfied, 2 = Dissatisfied, 3 = Neutral, 4 = Satisfied, 5 = Very Satisfied)

#### Part 1: Basic Information

1. **Gender:**

Male    Female    Other    Prefer not to say

2. **Age Group:**

Under 18    18–25    26–35    36–45    46–60    Over 60

3. **Purpose of Travel:**

Business    Leisure/Tourism    Visiting family/friends    Transit    Other:

\_\_\_\_\_

4. **How often do you travel by air each year?**

Less than once    1–3 times    4–6 times    7–10 times    More than 10 times

**5. Is this your first time using Chongqing Jiangbei International Airport?**

- Yes  No

**Part 2: Satisfaction Assessment (1 to 5 scale)**

1. How satisfied are you with the availability and comfort of seating in the waiting areas?
2. How do you feel about the environmental design and green concept of the airport?
3. How satisfied are you with the variety and availability of the airport's self-service equipment and services (e.g., check-in, boarding, kiosks, charging facilities)?
4. How clear and easy to follow is the airport's signage and guidance system, including mobile navigation tools?
5. How satisfied are you with the cleanliness and maintenance of the airport?
6. How satisfied are you with the availability and condition of baggage trolleys throughout the terminal?
7. How satisfied are you with the timeliness and accuracy of flight information updates?
8. How would you rate your experience regarding baggage claim accuracy and waiting time?
9. Do you find the airport's services consistent during different times or under varying passenger volumes?
10. How reliable do you find the airport's handling of flight delays or other unexpected events?
11. How consistently available and stable do you find the airport's free Wi-Fi service?
12. How reliable do you find the condition and availability of shuttle buses between terminals and parking areas?
13. How quickly and effectively do staff or systems respond when you seek assistance?
14. How easy is it to find service points or get help when facing questions at the airport?
15. How would you rate the response speed and user experience of the airport's digital services (e.g., mobile app, official WeChat account, mini-programs)?

16. During peak periods or emergencies, do airport staff respond promptly and provide necessary assistance?
17. How promptly are you assisted when requesting a wheelchair or other mobility aid?
18. How satisfied are you with the availability of multilingual staff at information desks?
19. How professional are airport staff in terms of service attitude, communication, and operational skills?
20. How orderly and standardized do you find the procedures in key service areas (e.g., check-in, security checks, inquiry desks)?
21. Do you feel confident in the consistency and quality of the airport's service processes?
22. How much trust do you have in the airport's ability to continuously improve service quality?
23. How clear and audible do you find the safety announcements and boarding calls?
24. How secure do you feel walking through the terminal, given visible security personnel and equipment?
25. Do you think the airport considers and accommodates the diverse needs of different passengers?
26. How comprehensive do you find the services for special groups (e.g., elderly, children, persons with disabilities)?
27. How satisfied are you with the cultural and aesthetic aspects of the waiting environment (e.g., art displays, leisure areas)?
28. In urgent situations, are you able to quickly receive support from airport staff or volunteers?
29. How satisfied are you with the availability and comfort of nursing/mother's rooms?
30. How satisfied are you with the provision of children's play areas or family rest zones?