CQ Airport Air Cargo Service Quality Evaluation

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Abstract

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Against the backdrop of the global epidemic, CQ Airport has achieved a rare year-over-year increase in cargo and mail throughput, which is among the highest in the country, due to the tightness of its cargo entry and exit process, its unique geographical location, the country's strong development and, most importantly, CQ Airport's ability to provide personalized and differentiated services to its customers. Although the cargo market of CQ airport is developing rapidly, there are still some shortcomings in its cargo service quality, and there is no service quality evaluation index system in the airport cargo industry, so the airport cannot effectively evaluate and improve its cargo service quality.

Therefore, this paper firstly constructs the airport cargo service quality evaluation index system by reviewing a lot of literature, asking experts' opinions and combining the theoretical knowledge of air cargo, then invites experts to score the weights of each index and check the consistency of the data, then designs the questions of the questionnaire according to the meaning of each index, then distributes the questionnaire to the staff of the airport and the companies that have business with the airport. The questionnaires were then distributed to the airport staff and employees of companies doing business with the airport, followed by a reliability analysis of the questionnaire results, and finally, the data collected were calculated using the fuzzy evaluation method to obtain the scores of cargo service quality of CQ airport and to propose corresponding optimization suggestions on how to further improve the cargo service quality of the airport.

Key words
Airports, air cargo, service quality, analytic hierarchy process, fuzzy comprehensive evaluation

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1 Introduction

Since the 21st century, with the rapid development of civil aviation industry and the process of trade globalization, air cargo plays an increasingly important role in the global logistics system. Compared with traditional transport methods such as road transport, railroad transport, sea transport and pipeline transport, air freight has obvious advantages such as fast transport time, high stability, safety and reliability. However, it also has the highest transportation costs, and therefore occupies only a small share of the traditional freight industry. With the rapid progress of technology, globalization of supply chains, accelerated product iterations, domestic consumption upgrades, the rise of e-commerce and other factors, cargo requirements for efficient and reliable transportation services continue to increase, the air cargo industry began to usher in a huge opportunity for development. (Cao & al. 2023)

1.1 Thesis structure

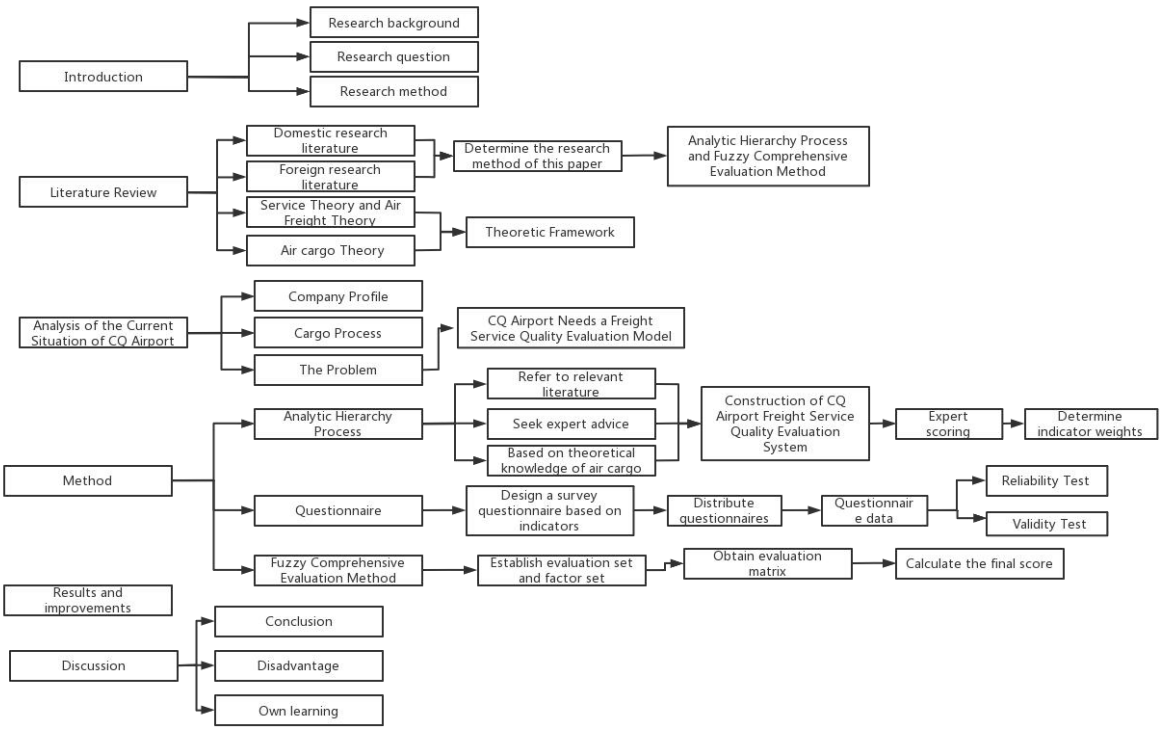

Figure 1.Thesis structure

The first chapter of this thesis begins with an introduction to the importance of air cargo to various industries and writes out the research questions of the thesis.

Chapter 2 is a literature review, which reviews the research methods of other scholars in studying service quality about the transportation industry and identifies the research methodology of this paper. and reviewed the service theory and air cargo theory knowledge.

Chapter 3 is to analyze the current situation of cargo service capacity of CQ airport, including service process, customer groups and the existence of problems.

Chapter 4 is to construct a freight service quality evaluation system and invite experts related to the industry to score the final calculation results.

Chapter 5 proposes improvement measures for CQ airport enhancement based on the previous calculation results. Chapter 6 concludes with a conclusion and writes about the findings and new things learned in this paper.

1.2 Background of the topic

In 2021, cargo and mail traffic at the country's airports reached 7,318,400 tons in 2021, an increase of 8.2% compared to 2020. Figure 2 shows the data of China's air cargo throughput from 2017 to 2021 published by the CAAC in the Statistical Report on the Development of the Civil Aviation Industry in 2021. (CAAC 2021.)China's air cargo industry has developed rapidly since the reform and opening up, especially in recent years with the rapid development of globalization, logistics industry and the rise of new business models such as e-commerce and cross-border e-commerce, China's air cargo industry has entered a period of rapid development. First, the infrastructure of China's air cargo industry has been continuously improved. China has built a number of modern cargo airports and air logistics parks, while building a number of airport cargo centers and air cargo professional enterprises, providing more convenient and efficient services for air cargo. Secondly, the market demand for China's air cargo industry continues to grow. (Cao & al. 2022)With the rapid development of China's economy and the increase in foreign trade, the market demand for the air cargo industry continues to expand. At the same time, the rise of China's e-commerce, cross-border e-commerce and other new industries, but also for the air cargo to provide new opportunities for development. (Liu 2022)Once again, the technology level of China's air cargo industry continues to improve. With the continuous innovation and development of aviation technology, China's air cargo industry is also constantly introducing advanced technology and equipment to improve the efficiency and safety of transportation. Finally, our government's support for the air cargo industry has been increasing. Our government has introduced a series of policies and measures to support the development of the air cargo industry, including increased investment in air cargo infrastructure construction, the introduction of tax and subsidy policies, and

the optimization of cargo clearance processes. In short, China's air cargo industry is in a period of rapid development, with broad market prospects and room for development. In the future, China's air cargo industry will continue to promote technological innovation and service upgrades, improve transport efficiency and safety, and provide faster, more efficient and safer logistics services for the economic development of the country and the region. (The State Council The People’s Republc Of China 2020.)

Since 2020, the outbreak of the new crown epidemic has seriously affected the development of the civil aviation industry. On the one hand, travel restrictions in various countries have brought air passenger traffic to a near standstill. On the other hand, the air cargo industry is once again entering the best golden period of development in the last decade due to the reduction of passenger aircraft belly capacity, disruption of sea-rail transportation and the surge of transportation demand. Air cargo services have become an important transportation channel connecting regions to each other in a geographical sense. In the long-term social environment since the epidemic, the air cargo industry has some new development background, such as: large-scale suspension of global passenger flights, a significant reduction in the belly capacity of passenger aircraft, the traditional sea-rail transportation in one direction caused serious congestion on transport routes, production and consumption and other logistics needs can not be shipped smoothly on schedule, greatly testing the resilience of the global supply chain. The epidemic caused a large amount of new transportation demand for epidemic prevention materials such as masks, disinfectants, and new coronavirus testing kits. The physical quarantine caused by the epidemic brought about a huge incremental demand for e-commerce, which required quality freight service capabilities to achieve. (Wang & Peng 2022)

In such a context, air cargo urgently needs to take such a rare opportunity for development as an opportunity to improve the weakness of the quality of cargo services of our national airlines, to make up for the huge losses brought by air passenger transport, to narrow the gap with the quality of cargo services of advanced foreign airlines, and to become the ballast of Chinese civil aviation enterprises in the current difficult period to overcome difficulties and stand firm. On the other hand, air cargo, as an important dynamic branch of modern trade in China and the world, is also in urgent need of a clear understanding and improvement of service quality in modern trade in China and the world, in order to more effectively serve the logistics needs of China's modern social manufacturing, retail, e-commerce and other industries. (Song 2022)

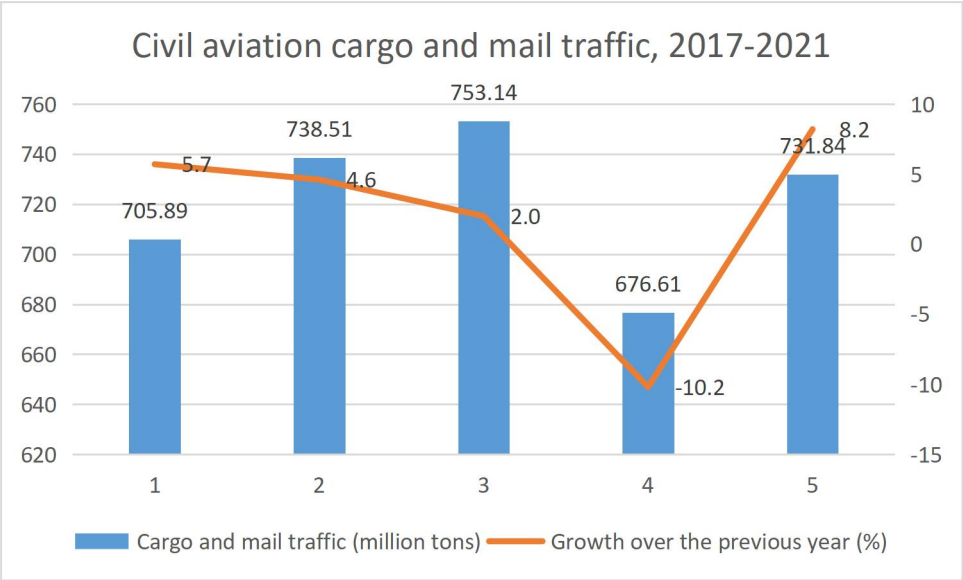

Figure 2.Civil aviation cargo and mail traffic, 2017-2021

1.3 Research problem

It is difficult for the air cargo industry to obtain objective feedback about the level of service it provides, mainly because of the lack of effective assessment methods. Current traditional service industries, such as restaurants, hotels, and couriers customers can feel the level of customer satisfaction through face-to-face conversations or collect customer feedback through Internet platforms. But the air cargo industry, due to the limited physical environment for interaction with customers in the service process, also does not have a platform for evaluation to obtain the true feelings of customers. The absence of a framework service quality evaluation system makes it impossible to effectively monitor the complex air cargo service process, and it is also impossible to reflect the objective and accurate level of airline cargo service quality, and it is difficult to follow up on cases of single service exceptions. Therefore, the establishment of an objective and comprehensive service quality evaluation system is beneficial for CQ airports to improve their cargo quality.

The primary goal of this paper is to create a cargo service quality evaluation system for CQ airports. This evaluation system can help CQ airport to collect customer feedback, and the airport can use this feedback to identify the shortcomings of its own processes and improve them.

1.4 Methodology

1.4.1 Literature Research Method

Literature research method refers to the method of conducting research by reviewing relevant literature. In scientific research, academic research and research in other fields, literature research

method is a common research method that helps researchers to understand the current status of relevant research, analyze problems, obtain data, formulate research hypotheses, and verify research conclusions.

1.4.2 Analytic hierarchy process

Analytic hierarchy process is a multi-criteria decision analysis method for dealing with complex relationships among multiple factors and multiple objectives in order to support decision makers in integrated assessment and decision making. The method decomposes the decision problem into a hierarchical structure, breaking it down layer by layer from the general to the details, with each level including a set of factors or objectives of relative importance. The decision maker compares and evaluates the factors or objectives at each level to determine their relative weights and calculate the final decision solution. The method is usually supported and implemented using mathematical models and computer software.

1.4.3 Fuzzy comprehensive evaluation method

Fuzzy comprehensive evaluation method is a comprehensive evaluation method using fuzzy mathematical theory. It is mainly applicable to problems where qualitative analysis and quantitative calculation are not easy to clarify and determine, involving multiple factors and indicators, and it is difficult to accurately quantify the relationship between these factors and indicators. The method converts the indicators into fuzzy numbers by defining the fuzzy affiliation function of each indicator, and combines expert experience and knowledge to weight each indicator to produce comprehensive evaluation results.

2 Literature Review

2.1 Analysis of the current status of domestic and international research

In recent years, China has made great achievements in the development of civil aviation, and is currently in the sprint stage and high-quality development stage of accelerating the leap from a large air transportation country to a strong air transportation country. With the rapid development of the aviation industry, it is particularly important to build an effective service quality evaluation system and improve the service quality level in a targeted manner. The issue of service quality of airports has received much attention and attention from scholars at home and abroad, and more research results have been achieved.

2.1.1 Research using hierarchical analysis

Kannan V. (2010)provided a framework based on analytical hierarchy process for sea container carriers operating in India to help them benchmark their service quality. Hongyan Wang and Yaxi Xu (2015)constructed an airport service quality evaluation system based on hierarchical analysis and described the specific evaluation process of the model. Singh A. K. (2016)measured the competitive service quality performance of domestic full service airlines in India by providing a framework based on the analytical hierarchy process to benchmark their quality in order to improve competitiveness and gain competitive advantage. Sun Gui'e (2019)used hierarchical analysis to establish a service quality evaluation system for B2C cross-border e-commerce logistics enterprises from the whole process of B2C cross-border e-commerce logistics and proposed the improvement of service quality of cross-border e-commerce logistics enterprises.

2.1.2 Research using hierarchical analysis and fuzzy comprehensive evaluation method

Linlin Wang et al. (2016)used hierarchical analysis to establish the evaluation index system of airport service quality, and then used the comprehensive integrated weighting method based on game theory to determine the evaluation index weights, and used the fuzzy comprehensive evaluation method to evaluate and analyze the airport service quality. Shuo Liu and Baozhu Li (2018)qualified prequalification factors of logistics service quality that directly affect consumers' perceptions, including personalized information service quality, logistics guarantee center service quality, logistics process service quality, service failure recovery quality, construction of scientific system basic research framework and specification, and physical analysis of existing platform with Analytic hierarchy process and fuzzy evaluation method as research objects. Mei Yingtian et al. (2019)determined the index weights by Analytic hierarchy process and used fuzzy comprehensive evaluation method to evaluate the quality of freight service, which improved the accuracy of the

traditional fuzzy comprehensive evaluation results. Wei Li (2022)used hierarchical analysis and fuzzy comprehensive evaluation method to G airline cargo, and got clearer and more systematic evaluation results of G airline cargo service quality. With the help of the analysis of the evaluation results, this paper finds the shortcomings of G airline cargo service quality and analyzes its formation causes.

2.2 Overview of service theory

A service is an economic activity that is provided by one party to another in a manner that provides a specific function or satisfies a need without the direct possession or use of a product or good. Services can exist in either material form (e.g., restaurants, tourism, etc.) or immaterial form (e.g., education, healthcare, etc.). The difference between a service and a product is that a service is based on providing a certain function or satisfying a certain need, while a product is based on the production and sale of a commodity. The quality and efficiency of services have a great impact on customer satisfaction and loyalty; therefore, the service industry focuses on improving the quality and efficiency of services to meet customer needs and expectations.

The service quality model proposed by Parasuraman A. et al. (1985)in the United States divides service quality into three aspects: customer expectations, service quality, and customer perceptions, and assesses the strengths and weaknesses of service quality by comparing the gap between customer expectations and actual service quality.The service design approach proposed by Bitner M. et al. (2008, 50)in the United States identifies each part of the service process by outlining the service process to improve the efficiency and quality of the service. The service positioning theory proposed by Zeithaml V. et al. (2008)in the United States divides services into two types of standardized services and customized services, and determines the characteristics of services and differentiation strategies through service positioning. The service quality theory proposed by CA Grönroos (1984)in the U.S. divides service quality into two types of technical quality and functional quality to meet consumers' needs by providing high-quality services. The service innovation theory proposed by Gallouj F. et al. (2009)in Europe divides service innovation into three types of service content innovation, service process innovation and service model innovation to improve the competitiveness and value of services through different innovation methods.

Service theory refers to the theoretical system that studies the principles, laws and methods of service economic activities. Service economic activities mainly refer to the economic activities whose main purpose is to provide services, including commercial services, public services and social services. The research scope of service theory includes industrial organization, market

structure, competitive strategy, policy and management of service industry, as well as service innovation, service quality, service pricing, service marketing and service management of service enterprises. Service theory is a multidisciplinary crossover field involving economics, management, marketing, psychology and other disciplines, which has important theoretical and practical values in modern service economic activities. The development of service theory is constantly improved and deepened with the continuous development of service economic activities, providing guidance and help for service enterprises, and also providing better service experience and service quality for service consumers.

2.3 Overview of air cargo theory

Air cargo is a service that uses aircraft to transport goods, and it is an integral part of the modern logistics system. Air cargo is generally divided into two types: international cargo and domestic cargo. International cargo refers to the air cargo services carried out across national borders, while domestic cargo is the air cargo services carried out within the country. Xie Siyuan et al. (2021)proposed that air cargo management mainly involves the theory of organizational management, logistics management and information management of air cargo enterprises. Among them, logistics management is the core of air cargo, including the planning, organization, implementation and control of air cargo. Cao Yunchun et al. (2023)proposed the theory that air cargo market mainly involves market demand, market supply, and market price. The supply and demand in the air cargo market is the basis for the survival and development of air cargo companies, so market research and analysis are needed to develop appropriate market strategies. Yanwei Li and Wenqian Yang (2022)proposed the theory that air cargo transportation mainly involves the mode of transportation, means of transportation, and transportation routes of air cargo. The mode of transportation of air cargo includes direct transportation and transshipment transportation, the means of transportation includes cargo planes and passenger planes, and the transportation routes need to consider factors such as routes and flight frequencies. Zhang Le (2021)proposed that air cargo safety mainly involves the theory of air cargo safety management, flight safety, cargo safety and other aspects. Air cargo enterprises need to establish a sound safety management system and take effective safety measures to ensure the safety and reliability of air cargo.

To sum up, the theory of air cargo involves many aspects, and it is necessary to comprehensively use relevant knowledge and theories to continuously improve and optimize the service system of air cargo to meet the needs of customers and changes in the market.

2.4 Theoretical Framework

By reviewing a large amount of literature, the authors found that the common methods used by domestic and foreign research scholars to study service quality in the transportation industry can be divided into three types, namely hierarchical analysis, fuzzy comprehensive evaluation method, and two methods used together. In studying these methods, author found that when using only the Analytic hierarchy process as a research method, it is difficult to ensure the consistency of thinking when encountering the number of evaluation indicators at a certain level exceeds four, and the evaluation results lack precision. And the weight setting of the fuzzy comprehensive evaluation method lacks authority. Therefore, the research method of this paper is to use the combination of hierarchical analysis and fuzzy comprehensive evaluation method.

The SERVQUAL evaluation model is based on a sample of five companies surveyed in three industries (telephone maintenance, retail banking and insurance). On the one hand, the limited size of its sample leads to the inability of SERVQUAL to make the problem clear and objective. On the other hand, the choice of industries, telephone maintenance, retail banking and insurance, cannot fully reflect the common characteristics of all service industries, at least for passenger transportation, which is an industry of decreasing quality, is not represented. Therefore, in this paper, the service quality evaluation index design of air cargo is referred to the 22 indexes of SERVQUA model, firstly, the indexes related to airport cargo service are selected, and then new indexes are added according to the air cargo process, and then these indexes are divided into six dimensions according to the theoretical knowledge of air cargo.

3 CQ Airport Cargo Service Capacity Status

3.1 Introduction to Cargo Business at CQ Airport

CQ Airport's cargo and mail throughput has been growing steadily, with 477,000 tons of cargo and mail throughput in 2021, an increase of 15.9% year-on-year. CQ Airport has developed into an air cargo hub in the western region with cargo routes connecting major cities around the world. CQ Airport's cargo business mainly includes import and export cargo, domestic cargo and special cargo transportation. Regarding the import/export cargo business, CQ Airport has a comprehensive import/export cargo system, which can provide cargo transportation services between major cities around the world. The import cargo services provided by the airport include customs clearance, inspection, loading and unloading, etc., while supporting the storage and distribution of imported cargo. Export cargo services include cargo receiving, packing, loading and unloading, warehousing, and transportation, providing exporters with one-stop cargo transportation services. Regarding domestic cargo, CQ airport cargo routes cover major cities in China, which can provide fast, efficient and safe transportation services for domestic cargo. The airport cargo complex is equipped with modern cargo handling equipment and storage management system, which can provide cargo transportation services for cargo enterprises in all aspects. Regarding special cargo transportation, CQ Airport supports many types of special cargo transportation, including dangerous goods, live animals, fragile goods, high-value products, etc. The airport is equipped with professional staff and equipment to ensure the safe transportation of special cargoes.(CQA, LTD. 2023.)

In addition, CQ Airport provides a variety of value-added services, including airline packaging, warehouse management, and cargo tracking. The airport has also carried out several innovations in cargo business, such as drone transportation and air express, to provide more comprehensive, professional and efficient services to cargo customers. In conclusion, CQ Airport cargo business has developed into an air cargo hub in the western region, with a good transportation network and a perfect service system to meet the needs of all kinds of cargo transportation.

CQ airport cargo department consists of cargo management department, cargo agency department, cargo sales department, air cargo service department and air cargo safety supervision department. The cargo management department is responsible for formulating cargo business development plans and operation management regulations, coordinating all related departments and ensuring the normal operation of cargo business. The freight forwarding department is responsible for signing freight forwarding contracts with cargo owners or shippers, accepting, processing and tracking the goods entrusted by customers, and arranging the transportation,

loading and unloading, and storage of goods. Freight sales department is responsible for developing new customers, maintaining old customers, promoting freight business and improving freight market share. Air Cargo Service Department is responsible for air cargo loading and unloading, transportation, storage, customs clearance and other services, and coordinates with freight forwarding department to deal with the cargo. Air Cargo Safety Supervision Department is responsible for air cargo safety supervision to ensure the safe transportation of goods and coordinate with relevant departments to deal with cargo safety issues. (CQA, LTD. 2022.)

3.2 Air cargo service process

In general, cargo owners who choose to use air freight have higher requirements for cargo transportation than traditional freight, so the expectations of cargo owners and customers for air transport are also far beyond other traditional transport methods. In addition to the most basic airport-to-airport physical displacement services, the front-end service interactions that customers can directly perceive and the cooperation of back-end support systems that customers cannot know about are also more demanding for airlines than for other modes of transportation. As shown in Figure 3 and Figure 4 CQ airport inbound and outbound cargo service flow. (CQA, LTD. 2023.)

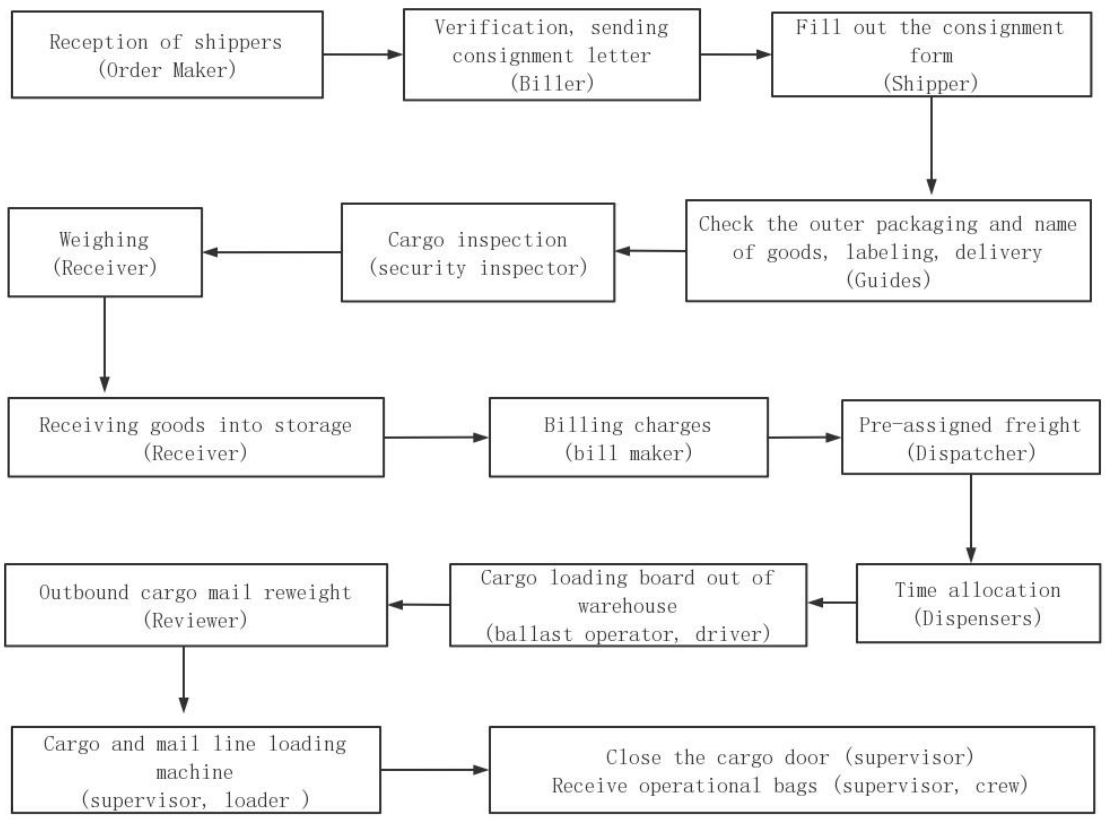

Figure 3.CQ Airport Cargo Entry Process

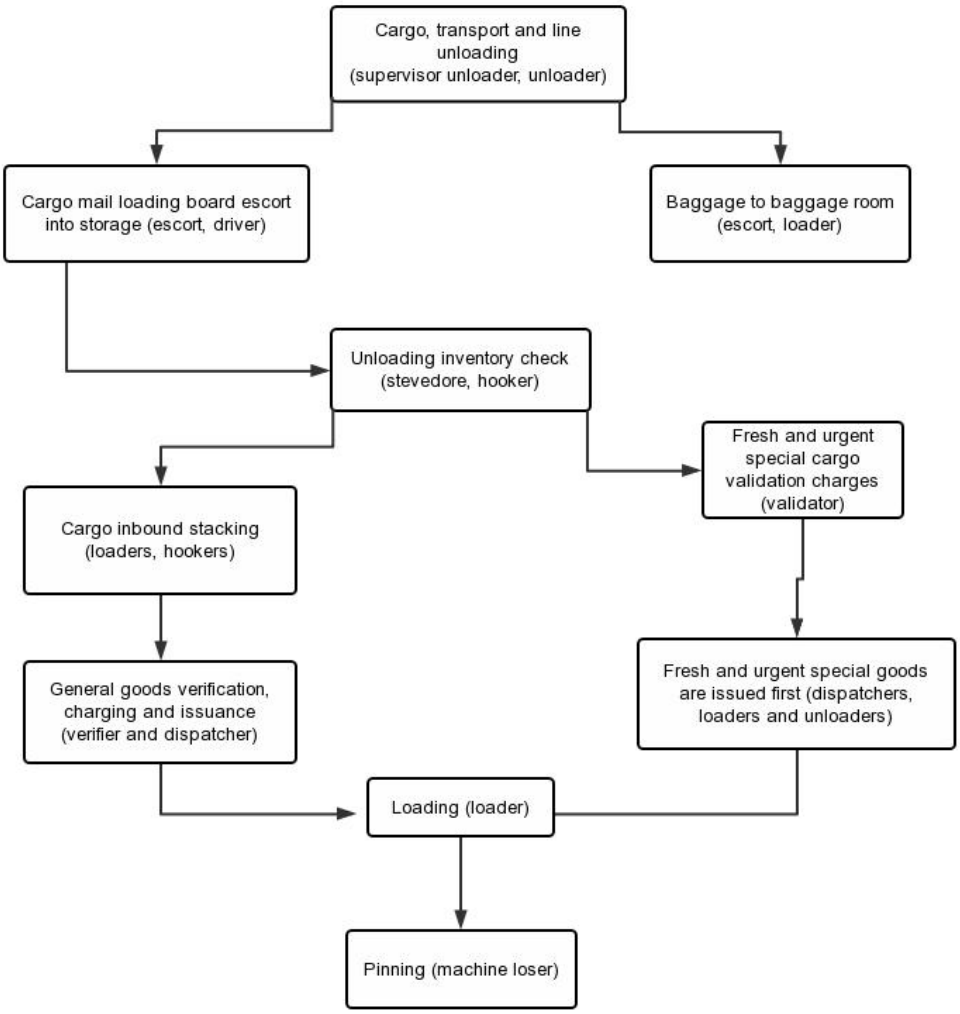

Figure 4.CQ Airport Cargo Departure Process

3.3 Problems of cargo services in CQ airports

Domestic airports have a large gap in passenger and cargo development mainly because at the practical level, there is no real balance in the allocation of passenger and cargo resources, and there are certain problems in the operation and management mechanism, cargo infrastructure, development model and other aspects, and these problems are also common in domestic airports. Specifically, the two main points include the uncertainty of transport time and cargo security issues. Transportation time uncertainty: airport freight services transport time by flight time, cargo clearance and other factors, so the transport time is not as stable and reliable as other logistics methods such as land transport. For some cargoes with more urgent time requirements, airport cargo services may not be able to meet the demand. 165 transportation time problems occurred at CQ Airport from 2019-2021, and 70 incidents of cargo delays occurred due to late information

transmission. Cargo security issues: Airport cargo services need to go through several stages, such as cargo receiving, loading and unloading, and transportation, and cargo security issues need to be given more attention. In the process of cargo transportation, cargo damage and loss may occur, requiring cargo service providers to strengthen cargo security measures. 113 incidents due to cargo breakage and loss occurred at CQ Airport in 2019-2021.(CQA, LTD. 2022.)

In practice, the management of CQ Airport had repeatedly criticized and educated employees by holding meetings and team and employee discussions about individual conversations and other forms of follow-up questions basically just floating on the matter itself for the frequent unusual cases. The team generally believes that the company's service has a pretty good reputation in the industry and that there is no need to make too many changes, just maintain the status quo. These service error deviations may not be due to the quality of the company's service, but to other reasons. The team members are following the existing procedures, not making any irregularities, and the service quality in the air cargo industry cannot be 100% standard. Therefore, it is especially important to establish a system for evaluating the quality of cargo services in order to improve service quality at CQ airports.

4 Method

4.1 Construction of evaluation index system

The literature on cargo service quality evaluation is summarized through literature analysis method. Since there is very little literature on air cargo service quality evaluation, we focus on listing the indicators that may be adopted by CQ airports in the actual operation of service evaluation that are similar to the traditional cargo way, and summarize, summarize and filter them. According to the specific nodes and situations in the actual air cargo service process, the wording descriptions are adjusted and combined to make them more consistent with the actual situation of air cargo service.

By analyzing the CQ airport cargo service process, nodes that may produce service perception by customers are summarized, and new indicators with air cargo characteristics are added on the basis of the indicators summarized in the literature. By interviewing air cargo related experts to collect modification suggestions, the CQ airport cargo service quality evaluation index was finally formed.

In terms of evaluation dimensions, the SERVQUAL service quality evaluation model for the traditional service industry evaluates service quality in five dimensions, including: tangibility, reliability, responsiveness, assurance and empathy. This classical service quality model is generally applied to the service evaluation of end-consumer industry because it focuses on the service expectation and service perception of customers. It is not completely applicable to the service evaluation of business-oriented customers like air cargo. However, in terms of service attributes, corporate customers of freight transport also have different degrees of service perceptions in various aspects, so there are also dimensions in the traditional service quality evaluation model that can be used for reference. Finally, according to the actual situation of air cargo development, reliability is split into safety and cost effectiveness, responsiveness and assurance are combined into service quality, and tangibility is split into three dimensions, namely transportation efficiency, information feedback and route coverage.

4.1.1 The selection process of indicators

By summarizing a large amount of literature, sorting out the cargo service process of CQ airports and collecting opinions from industry experts, we finally formed an evaluation layer including safety, transportation efficiency, information feedback, cost effectiveness, route coverage and service quality as dimensions, containing 18 evaluation indicators.
As shown in Figure 5.

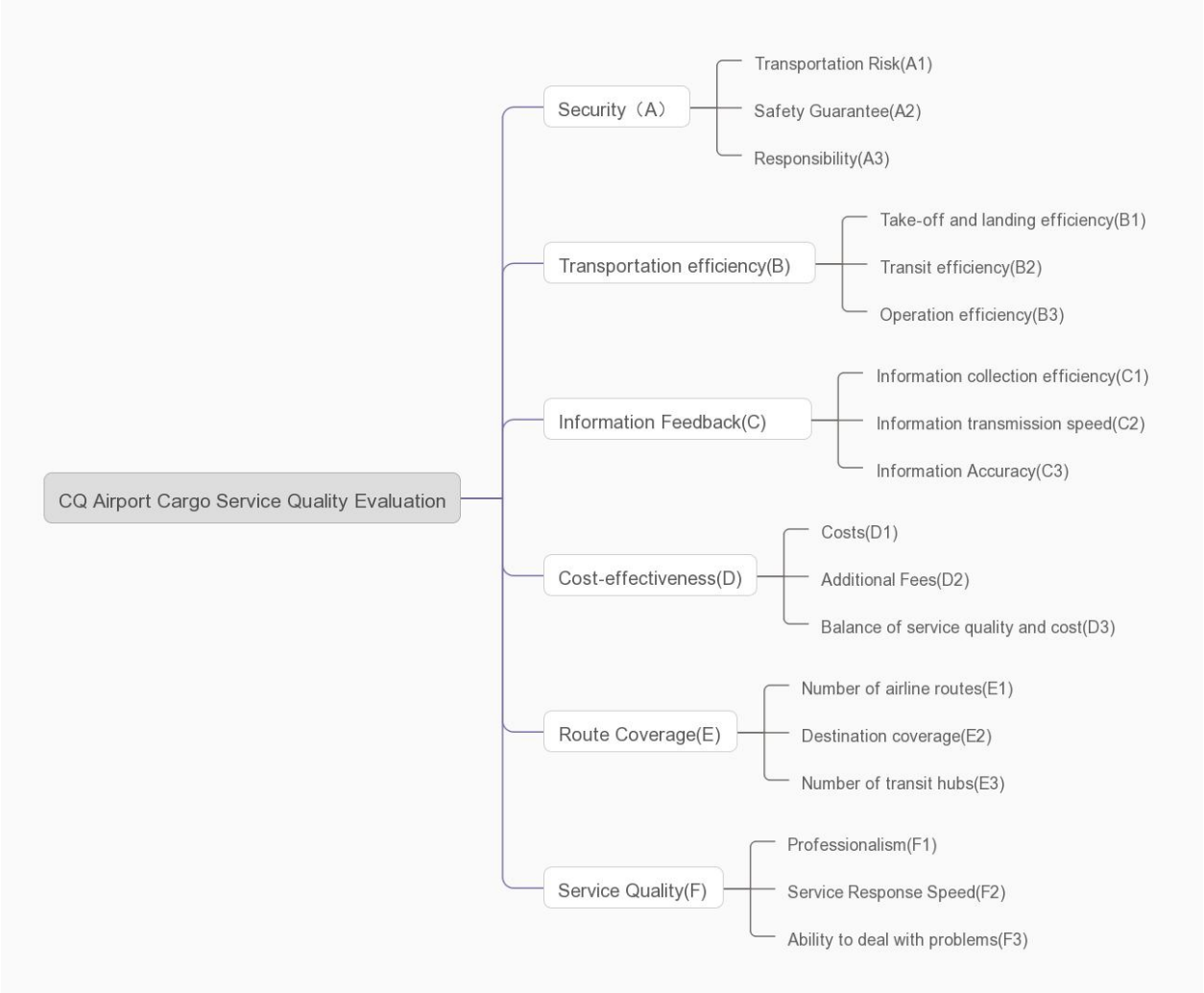

Figure 5.Hierarchical Model of CQ Airport Cargo Service Quality Evaluation Indicators

4.1.2 Interpretation of secondary indicators

Indicator Level	Explanation
Shipping Risks	Damage, loss or delay to people, goods or equipment due to various factors during airport transportation.
Safety Guarantee	The airport's security measures in security inspection, prevention of terrorist attacks, fire safety, civil aircraft safety, traffic safety, etc.
Responsibility	The airport's attitude in taking responsibility and emergency handling capability after a cargo accident.
Take-off and landing efficiency	The ratio of the number and time of aircraft completing takeoff or landing in a given time period.
Transfer Efficiency	The speed and effectiveness of the time required for the entire process from cargo arrival to departure from the airport, related to flight schedules, operational efficiency and speed of customs clearance.
Operation efficiency	The number of cargo and related procedures

	completed per unit of time, related to flight scheduling, facilities and equipment, and logistics-oriented information systems
Information collection rate	The speed of cargo information collection by airport staff
Information transmission speed	The rate at which cargo transmits information between internal airport systems, related to the airport's internal network facilities and data processing capabilities
Information accuracy	All information related to import and export cargo (such as flight number, departure time, arrival time, route, cargo type, quantity, weight, destination, etc.) can be recorded and accurately reflected in the cargo tracking system in a timely and complete manner.
Costs	CQ airport transportation fees charges compared to other airports
Additional Costs	Customs clearance fees, handling fees, storage fees, fuel surcharges and other fees have reasonable authorized standards
Balance of service quality and cost	The extent to which airport transportation services can provide benefits or meet demand after paying certain fees
Number of airline routes	The number of flight routes and airlines that the airport can provide and operate
Destination coverage	The ratio of the number of destination cities that can be reached directly from the airport to the number of all possible destination cities
Number of transit hubs	Number of flights capable of transiting through CQ airports
Professionalism	The expertise and knowledge of the staff at each step of the process, from handling dangerous goods to checking cargo documentation
Speed of service response	The response time of airport staff to your inquiries, requests, cargo exceptions, claims, etc.
Effective communication	The need for staff to maintain friendly and professional communication in order to understand the customer's needs and resolve possible problems

Table 1. Interpretation of CQ Airport Cargo Service Quality Evaluation Indicators

4.1.3 Data source

The data sources regarding the determination of weight values were obtained using the expert scoring method. In this paper, five air cargo-related experts were invited to score the importance among the indicators to ensure the authority and objectivity of the data sources. Some of these five experts had offered valuable advice in previous indicator selections and were originally familiar with the purpose of this study. In this paper, a well-presented matrix questionnaire was designed

and distributed via email or on-site interviews to five experts with extensive management experience in the air cargo industry, and the experts returned via email or on-site notes after completion. Because of the logical nature of the comparison of weights among the indicators, the logical rules of the comparison matrix were explained in detail by telephone before they answered separately. The final questionnaires were collected and answered completely. Each collected data was then aggregated and the final indicator weight vector was calculated using the geometric mean calculation method.

Experts	Position
1	General Manager of Shanghai JD Air International Freight Forwarding Co.
2	Director of Logistics Department, Chongqing JF Co.
3	Head of Cargo Department, CQ Airport Passenger & Cargo Agency Co.
4	NF Airlines Cargo Manager
5	Head of Logistics Department, Chongqing CY Chemical Co.

Table 2.List of experts surveyed for evaluation index weights

a_{ij}, indicator i : indicator j	Quantified values
equally important	1
Slightly important	2
Important	3
Significantly important	4
Very important	5
Countdown	$a_{ij}=1/a_{ji}$

Table 3.Provisions for comparing quantitative values between indicators

The specification of quantitative values for comparison between indicators is achieved by introducing a scale of 1-5.

4.2 Analytic hierarchy process

After aggregating the importance judgment matrices of the five experts and geometrically averaging the importance degree between the two indicators of each matrix cell, the following judgment matrix can be obtained, including a dimensional importance comparison matrix and six indicator system comparison matrices.

	A	B	C	D	E	F
A	1	1.32	1.52	2.17	2.35	1.89
B	0.76	1	1.15	1.32	1.52	1.64
C	0.66	0.87	1	1.43	1.89	1.32
D	0.46	0.76	0.70	1	1.15	0.80
E	0.43	0.66	0.53	0.87	1	0.70
F	0.53	0.61	0.76	1.25	1.43	1

Table 4.Evaluation dimension importance judgment matrix

	A1	A2	A3
A1	1	1.32	1.43
A2	0.76	1	1.25
A3	0.70	0.80	1

Table 5.Security index importance judgment matrix

	B1	B2	B3
B1	1	1.32	1.52
B2	0.76	1	1.25
B3	0.66	0.80	1

Table 6.Transportation efficiency indicators importance judgment matrix

	C1	C2	C3
C1	1	0.76	0.43
C2	1.32	1	0.46
C3	2.35	2.17	1

Table 7.Matrix for determining the importance of information feedback indicators

	D1	D2	D3
D1	1	1.52	0.43
D2	0.66	1	0.36
D3	2.35	2.77	1

Table 8.Cost-effectiveness indicator importance judgment matrix

	E1	E2	E3
E1	1	1.15	1.32
E2	0.87	1	1.15
E3	0.76	0.87	1

Table 9.Route coverage index importance judgment matrix

	F1	F2	F3
F1	1	1.43	1.32
F2	0.70	1	0.80
F3	0.76	1.25	1

Table 10.Service quality index importance judgment matrix

Using the arithmetic mean method (sum-product method) for the comparison matrix of one evaluation dimension and the comparison matrix of six evaluation indexes after the aggregation of expert scoring of the airport cargo service evaluation index system, the weight value of each dimension can be obtained, and the maximum eigenvector of the judgment matrix, CI value.

Item	Eigenvector	Weight value	λ_{max}	CI
A	1.57	26.01%		
B	1.15	19.05%		

C	1.08	17.92%		0.005
D	0.75	12.42%		
E	0.64	10.71%	6.027	
F	0.84	13.90%		

Table 11.Evaluation dimension weighting analysis results

Item	Eigenvector	Weight value	λ_{max}	CI
A1	1.22	40.61%		
A2	0.97	32.30%	3.003	0.002
A3	0.81	27.09%		

Table 12.Safety index weighting analysis results

Item	Eigenvector	Weight value	λ_{max}	CI
B1	0.64	21.17%		
B2	0.78	26.02%	3.009	0.004
B3	1.59	52.82%		

Table 13.Results of weighting analysis of transportation efficiency indicators

Item	Eigenvector	Weight value	λ_{max}	CI
C1	1.22	40.66%		
C2	0.94	31.46%	3.002	0.001
C3	0.84	27.89%		

Table 14.Results of weighting analysis of information feedback indicators

Item	Eigenvector	Weight value	λ_{max}	CI
D1	0.78	25.90%		
D2	0.56	18.49%	3.010	0.005
D3	1.68	55.61%		

Table 15.Results of weighting analysis of cost effectiveness indicators

Item	Eigenvector	Weight value	λ_{max}	CI
E1	1.14	38.05%		
E2	0.99	33.11%	3.001	0.001
E3	0.87	28.84%		

Table 16.Results of weighting analysis of route coverage index

Item	Eigenvector	Weight value	λ_{max}	CI
F1	1.22	40.61%		
F2	0.81	27.09%	3.004	0.002
F3	0.97	32.30%		

Table 17.Service quality index weighting analysis results

4.2.1 Consistency testing

To prevent possible logical errors in the judgment matrix, a hierarchical ordering and consistency check of the judgment matrix is required, which is calculated as follows:

First, the maximum eigenvectors λ,where B is each judgment matrix listed in the previous section and W is the matrix eigenvector, are calculated for the index and dimensional judgment matrices in the previous section.

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{[BW]_i}{nw_i}$$

Then calculate the CI value of the consistency index of the judgment matrix;

$$CI = \frac{\lambda_{\max} - n}{n-1}$$

Finally, the random consistency index RI value is queried and the consistency ratio CR is finally calculated.

$$CR = \frac{CI}{RI}$$

The maximum eigenvalue of the judgment matrix and the consistency index CI have been obtained in the calculation of the previous section, and the RI value is obtained by querying Table 18. The RI value is the query value used in the process of consistency test of hierarchical analysis, which is the average value obtained after 500 sampling tests by scientists. It is generally applied to the consistency check of judgment matrix.

Number of steps	1	2	3	4	5	6	7	8	9	10	11	12
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46	0.49	0.52	1.54

Table 18.Consistency test RI values

The smaller the CR value, the better the consistency of the adopted judgment matrix, and the CR value needs to be less than 0.1 to prove that the judgment matrix passes the consistency test. If it does not pass, the judgment matrix must be checked and adjusted and rechecked. Table 19 shows the consistency test results of the seven summary dimension and indicator judgment matrices described in the previous section. The consistency ratio CR values of all matrices are less than 0.1, indicating that the inter-indicator judgment matrix of this paper is consistent.

	λ_{max}	CI	RI	CR	Consistency test results
Dimensional layer indicators	6.027	0.005	1.26	0.004	Pass
A indicators	3.004	0.002	0.52	0.004	Pass
B indicators	3.003	0.001	0.52	0.003	Pass
C indicators	3.009	0.004	0.52	0.008	Pass

D indicators	3.010	0.005	0.52	0.009	Pass
E indicators	3.001	0.001	0.52	0.001	Pass
F indicators	3.004	0.002	0.52	0.004	Pass

Table 19.Summary of Consistency Test Results

The consistency test is passed, and all evaluation dimensions and indicators have been assigned weight values, forming a more complete overall weight table of the air cargo service quality evaluation index system.

Target Level	dimensional level	Weights	Indicator Level	Weights
CQ Airport Cargo Service Quality Evaluation Index System	A	26.01%	A1	40.61%
			A2	32.30%
			A3	27.09%
	B	19.05%	B1	21.17%
			B2	26.02%
			B3	52.82%
	C	17.92%	C1	40.66%
			C2	31.46%
			C3	27.89%
	D	12.42%	D1	25.90%
			D2	18.49%
			D3	55.61%
	E	10.71%	E1	38.05%
			E2	33.11%
			E3	28.84%
	F	13.90%	F1	40.61%
			F2	27.09%
			F3	32.30%

Table 20.Overall weighting table of CQ airport cargo service quality evaluation indicators

This chapter uses the expert scoring method to score and summarize the constructed index judgment matrix, and uses the scoring data to assign weights to each evaluation dimension and index through the Analytic hierarchy process, which provides the index framework and weight data basis for the fuzzy comprehensive evaluation of CQ airport cargo service quality later.

4.3 Questionnaire

The questionnaire was designed on the basis of the indicators selected in Chapter 4 and the CQ airport cargo service quality evaluation system constructed on this basis, and its logic and structure were supported by this hierarchical framework. The questionnaire uses Likert's five-point option: "very satisfied", "satisfied", "average", "dissatisfied", and "very dissatisfied", so that respondents can more conveniently and easily make their own evaluation of their true feelings based on their own feelings of being served.

The questionnaire consists of three parts: description, basic information of respondents and satisfaction questions, including 4 basic information questions and 18 satisfaction questions, each question corresponds to 18 indicators.

The questionnaire was conducted online and offline at the same time. The respondent group of the questionnaire includes staff of CQ Airport and staff of companies that have cargo business dealings with CQ Airport, and their responsibilities include field operators, purchasing department, sales, customer service, and management. After screening out some questionnaires that took too short a time and those with all the same options, a total of 152 useful questionnaires were actually recovered, which basically met the data needs of this study. After collating the survey data, the basic information and evaluation data summary of CQ airport cargo service quality questionnaire were obtained.

Name	Option	Frequency	Percentage(%)	Cumulative percentage(%)
Gender	male	78	51.32	51.32
	female	74	48.68	100.00
Age	20-30	56	36.84	36.84
	31-40	61	40.13	76.97
	41-50	24	15.79	92.76
	51-60	11	7.24	100.00
Department	Capacity purchasing	33	21.71	21.71
	Customer service	35	23.03	44.74
	sales	32	21.05	65.79
	Front-line work	30	19.74	85.53
	management	22	14.47	100.00
Rank	commissioner	69	45.39	45.39
	supervisor	38	25.00	70.39
	Department manager	24	15.79	86.18
	Deputy general manager	15	9.87	96.05
	General manager	6	3.95	100.00
Total		152	100.0	100.0

Table 21.Results of frequency analysis of basic information of the survey questionnaire

According to the basic information of the respondents, it can be seen that the questionnaire better covers different departments, different responsibilities and different experience of the company's employees, making the questionnaire results more objective and comprehensive.

Problem Indicators	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
A1	9	19	25	72	27
A2	8	17	36	64	27
A3	6	13	27	64	42
B1	8	9	30	70	35
B2	8	14	30	61	39
B3	7	7	31	65	42
C1	3	11	40	56	42
C2	6	11	37	58	40
C3	2	6	27	73	44
D1	1	14	41	56	40
D2	1	9	41	58	43
D3	1	7	28	63	53
E1	1	12	24	66	49
E2	1	12	32	56	51
E3	1	6	31	52	62
F1	3	8	26	59	56
F2	3	6	28	62	53
F3	1	4	26	65	56

4.3.1 Reliability test

The Cronbach's α coefficient (Cronbach's α) was used as an indicator of the intrinsic reliability of the questionnaire to make the determination. The judgment criteria are as follows:

Step 1:Firstly, analyze the alpha coefficient, if this value is higher than 0.8, it indicates high reliability; if this value is between 0.7 and 0.8, it indicates good reliability; if this value is between 0.6 and 0.7, it indicates acceptable reliability; if this value is less than 0.6, it indicates poor reliability;
Step 2:If the CITC value is lower than 0.3, the item can be considered for deletion;
Step 3:If the value of "alpha coefficient of deleted items" is significantly higher than the alpha coefficient, consider deleting the item and reanalyzing it;
Step 4:Summarize the analysis. (Cronbach, L. 1951)

Problem Indicators	Correction item total correlation(CITC)	The alpha coefficient of the deleted item	Cronbach alpha coefficient
A1	0.592	0.880	0.889
A2	0.528	0.883	

Problem Indicators	Correction item total correlation(CITC)	The alpha coefficient of the deleted item	Cronbach alpha coefficient
A3	0.503	0.884	
B1	0.614	0.879	
B2	0.612	0.879	
B3	0.555	0.882	
C1	0.509	0.883	
C2	0.495	0.884	
C3	0.460	0.885	
D1	0.447	0.885	
D2	0.466	0.885	
D3	0.451	0.885	
E1	0.586	0.881	
E2	0.544	0.882	
E3	0.424	0.886	
F1	0.524	0.883	
F2	0.512	0.883	
F3	0.552	0.882	

Table 22.Cronbach's reliability analysis

From the above table, it can be seen that the value of the reliability coefficient is 0.889, which is greater than 0.8, thus indicating the high quality of the reliability of the study data. For the "alpha coefficient of deleted items", there is no significant increase in the reliability coefficient when any item is deleted, thus indicating that the item should not be deleted. For the "CITC values", the CITC values of the analyzed items are all greater than 0.4, which indicates that there is a good correlation between the analyzed items, and also indicates a good level of reliability. In summary, the reliability coefficient values of the study data are higher than 0.8, which collectively indicates that the data are of high reliability quality and can be used for further analysis.

4.3.2 Validity test

The validity of the evaluation system was tested by examining the validity of the responses to the service quality evaluation questionnaire to see if the responses to the questionnaire were valid in terms of the indicators to be measured. The validity analysis was conducted using factor analysis, which is a data analysis method, to verify the validity level of the data by using KMO values, Bartlett's test, and other indicators. The judgment criteria are as follows:

Step 1:Analyze the KMO value: if this value is higher than 0.8, it means that it is very suitable for information extraction (from one side, it means good validity); if this value is between 0.7 and 0.8, it means that it is more suitable for information extraction (from one side, it means good validity); if this value is between 0.6 and 0.7, it means that information extraction is possible (from one side, it means average validity); if this value is less than If this value is less than 0.6, it means that the information is difficult to be extracted (a side effect of low validity).
Step 2:Validity analysis requires the need to pass Bartlett's test. (corresponding p-value needs to be less than 0.05)（Spearman, C. 1946）

KMO value		0.886
Bartlett sphericity test	Approximate cardinality	1113.059
	df	153
	p value	0.000

Table 23.KMO and Bartlett's test

The validity was verified using KMO and Bartlett's test, as seen in the table above: the KMO value was 0.886, with a KMO value greater than 0.8, and the study data were well suited to extract information (a good side reaction to validity).

4.4 Fuzzy integrated evaluation method

4.4.1 Construction of evaluation indicators

Fuzzy comprehensive evaluation method is a method to quantify some factors with unclear boundaries and not easy to quantify, and then make a comprehensive evaluation. Airport cargo service quality, as a service industry that is not clearly defined and lacks relevant systematic evaluation indexes, is not well measured in the evaluation of satisfaction, so the fuzzy comprehensive evaluation can be used to quantify this more fuzzy evaluation to data. The steps of fuzzy comprehensive evaluation method are as follows:
Step 1: Determine the evaluation indexes and rubric set; the evaluation indexes in this paper are the 6 evaluation dimensions and 18 evaluation indexes contained in the CQ airport cargo service quality evaluation system.
Step 2: Determine the weight vector matrix A and construct the weight judgment matrix R;
Step 3: Calculate the weights and make decision evaluation. (Wang P. Z. 1980)The weight values of each dimension and indicator have been derived in Table 20.

In this paper, the five-point Likert scale of very dissatisfied, dissatisfied, average, satisfied, and very satisfied are assigned five level scores: 55, 65, 75, 85, and 95, respectively, for later

calculation.In the fuzzy comprehensive evaluation process, there are four fuzzy operators available. In this paper, M(∧,+) is chosen.

4.4.2 Construct the affiliation matrix

The evaluation affiliation matrix of evaluation indicators is obtained by normalizing the summary questionnaire data by row.As shown in Table 24.

Problem Indicators	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
A1	0.059	0.125	0.164	0.474	0.178
A2	0.053	0.112	0.237	0.421	0.178
A3	0.039	0.086	0.178	0.421	0.276
B1	0.053	0.059	0.197	0.461	0.230
B2	0.053	0.092	0.197	0.401	0.257
B3	0.046	0.046	0.204	0.428	0.276
C1	0.020	0.072	0.263	0.368	0.276
C2	0.039	0.072	0.243	0.382	0.263
C3	0.013	0.039	0.178	0.480	0.289
D1	0.007	0.092	0.270	0.368	0.263
D2	0.007	0.059	0.270	0.382	0.283
D3	0.007	0.046	0.184	0.414	0.349
E1	0.007	0.079	0.158	0.434	0.322
E2	0.007	0.079	0.211	0.368	0.336
E3	0.007	0.039	0.204	0.342	0.408
F1	0.020	0.053	0.171	0.388	0.368
F2	0.020	0.039	0.184	0.408	0.349
F3	0.007	0.026	0.171	0.428	0.368

Table 24.Secondary evaluation index affiliation matrix

Combining the data in Table 24 and the weight values in Table 20, the evaluation affiliation of each dimension is obtained by fuzzy evaluation of the weight value of each indicator relative to the respective dimension with the indicator affiliation matrix within each dimension.

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.151	0.322	0.579	1.000	0.626
Affiliation Normalization【Weighting】	0.056	0.120	0.216	0.373	0.234

Table 25.Security affiliation calculation results

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.151	0.197	0.599	0.899	0.745

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation Normalization【Weighting】	0.058	0.076	0.231	0.347	0.287

Table 26.Transportation efficiency affiliation calculation results

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.072	0.184	0.684	0.962	0.818
Affiliation Normalization【Weighting】	0.027	0.068	0.251	0.353	0.301

Table 27.Information feedback affiliation calculation results

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.020	0.197	0.628	0.858	0.793
Affiliation Normalization【Weighting】	0.008	0.079	0.252	0.344	0.318

Table 28.Cost-effectiveness affiliation calculation results

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.020	0.197	0.572	1.000	0.942
Affiliation Normalization【Weighting】	0.007	0.072	0.210	0.366	0.345

Table 29.Route coverage affiliation calculation results

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.046	0.118	0.526	0.982	0.962
Affiliation Normalization【Weighting】	0.017	0.045	0.200	0.373	0.365

Table 30.Service quality affiliation calculation results

Summarizing all subsets in a matrix, we can get the target layer fuzzy evaluation matrix.

$$\mathrm{R} = \begin{bmatrix} 0.056 & 0.120 & 0.216 & 0.373 & 0.234 \\ 0.058 & 0.076 & 0.231 & 0.347 & 0.287 \\ 0.027 & 0.068 & 0.251 & 0.353 & 0.301 \\ 0.008 & 0.079 & 0.252 & 0.344 & 0.318 \\ 0.007 & 0.072 & 0.210 & 0.366 & 0.345 \\ 0.017 & 0.045 & 0.200 & 0.373 & 0.365 \end{bmatrix}$$

See Table 20 for the weight vectors of the dimensional layers.

$$A = (0.260 \quad 0.191 \quad 0.179 \quad 0.124 \quad 0.107 \quad 0.139)$$

$$B = A * R$$

This leads to the CQ airport service quality evaluation affiliation matrix.

	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied
Affiliation	0.173	0.460	0.956	1.000	0.974
Affiliation Normalization【Weighting】	0.049	0.129	0.268	0.281	0.273

Table 31.Calculation results of target layer affiliation

By combining the target layer affiliation with the set of rubrics the CQ airport cargo service quality evaluation score can be calculated, and according to the set of rubrics V=(55,65,75,85,95), a weighted average algorithm is used to score the CQ airport cargo service quality evaluation.

$$S = (0.049 \quad 0.129 \quad 0.268 \quad 0.281 \quad 0.273) * \begin{pmatrix} 55 \\ 65 \\ 75 \\ 85 \\ 95 \end{pmatrix} = 81.0$$

The affiliation degrees of the six evaluation dimensions are scored by the set of rubrics, and the satisfaction rubrics are assigned to each dimension as well as indicators according to the maximum affiliation principle of the fuzzy comprehensive evaluation method, which can be summarized.

Target Level	Score	dimensional level	Weight	Score	Evaluation	Indicator Level	Score
CQ Airport Cargo Service Quality Evaluation	81.0	A	26.01%	81.0	Average	A1	80.87
						A2	80.67
						A3	83.09
		B	19.05%	82.2	Average	B1	82.56
						B2	82.17
						B3	83.42
		C	17.92%	83.3	Average	C1	83.00
						C2	82.51
						C3	84.86
		D	12.42%	83.9	Average	D1	82.88
						D2	83.83
						D3	85.52
		E	10.71%	84.7	Average	E1	84.85
						E2	84.55
						E3	86.05
		F	13.90%	85.2	Satisfied	F1	85.31
						F2	85.27
						F3	86.24

Table 32.CQ Airport Cargo Service Quality Evaluation Score Summary

5 Results and Improvements

Through the fuzzy comprehensive evaluation results, the overall evaluation score for cargo service at CQ airport is 81, which is rated as average. The other six dimensional layers also only have a satisfactory rating for the service attitude. It can be seen that the cargo service quality of CQ airport still has much room for improvement.

5.1 Security

5.1.1 Results

Safety is the highest weighted of the six dimensions, but also the lowest scoring one. Although CQ Airport's attitude and handling measures after transportation accidents are recognized by customers, it needs to reduce transportation risks and improve security.

5.1.2 Improvements

Conduct routine safety training for all employees working with freight, including inspection of hazardous materials, how to properly operate equipment, and safety procedures. Ensure that all hazardous materials are identified in accordance with international convention standards and are properly handled and packaged according to the appropriate regulations. Specific procedures and safety measures must be followed when loading these dangerous goods to prevent accidents. Set up high-intensity modern monitoring systems, detection systems, and alarm systems for the airport cargo area, and implement monitoring and inspection of important places. We also deploy professional security teams to strengthen the control of the cargo pooling and transportation chain. Establish a network security system to prevent hacker attacks and other network attacks, and do a good job of information data backup and emergency response processing to capture problems in a timely manner and ensure the security and stability of information systems. Participate actively in international freight security agreements or organizations, share news and experience with other countries and institutions, and work together to improve global freight security.

5.2 Transportation efficiency

5.2.1 Results

Transportation efficiency has the second highest weighting and the second-lowest evaluation score. The scores of the indicators are ranked as follows: operational efficiency > takeoff and landing efficiency > transit efficiency. Transportation efficiency is also particularly important to customer perception of service, so CQ Airport should find ways to improve transportation efficiency.

5.2.2 Improvements

Introducing more advanced and efficient equipment and technologies, such as driverless vehicles and automated picking systems. These technologies can improve the speed and accuracy of cargo handling in warehouses and unloading areas, and reduce time consumption and errors. Optimize the flow of goods and establish a scientific, standardized and efficient process system, such as using data analysis to determine the best cargo transportation routes, optimize the security inspection process, etc., as well as reasonably set up cargo stacking locations to avoid cross-mixing and repeated handling. Provide professional skills training for staff to improve operational efficiency and adjust the number of staff according to the actual situation to ensure the smooth handling of cargo. Actively develop the air cargo market, attract more airlines and logistics companies to the airport, increase the frequency of flights and capacity supply, and enhance the volume of outbound cargo, while formulating reasonable pricing policies to promote the healthy and rapid development of the air cargo market. Develop and apply logistics information management platform, establish a unified data center, realize the whole visualization tracking and management of cargo flow, and improve cargo transportation efficiency and safety.

5.3 Information feedback

5.3.1 Results

The weighting of information feedback is ranked third and the score is ranked fourth. The ranking of the indicators is: information accuracy > information collection efficiency > information delivery speed. the accuracy of flight information or cargo information of CQ airport is very high, and the customer gives a rating close to 85, but the collection efficiency and delivery speed are somewhat poor.

5.3.2 Improvements

Applying modern technology to the field of airport cargo, using sensors and other equipment to detect cargo location, status and other information in real time, and automating the collection of this information into the system, thus improving the accuracy and efficiency of information collection. Establishing an intelligent platform that can automatically send timely cargo information to multiple parties such as consignees, airlines, and relevant departments makes information delivery faster and more accurate. At the same time, the introduction of artificial intelligence technology in information delivery enables more accurate identification of key information, such as arrival time and cargo status. By standardizing the management of airport cargo information and establishing a good data sharing and communication mechanism, it can make the information communication between different organizations more seamless and collaborate more smoothly.

This will enable to reduce the error rate and improve the traceability of cargo. Focus on optimizing operational processes and standardized work procedures at each processing node. Starting from the initial stages, such as packaging and metering of goods, the process is continuously optimized and updated based on data feedback and analysis. This leads to better efficiency and increased accuracy. Recruit and train a highly professional team of airport cargo professionals to continuously learn and update new technologies and conventional knowledge in the industry to create a green channel for securing cargo information at the airport.

5.4 Cost-effectiveness

5.4.1 Results

The cost effectiveness weighting ranked second to last, but the score was third. The indicator tier scores are ranked as follows: balance of service quality and price > extra costs > fees. Customers agree that CQ Airport freight costs are cost effective.

5.4.2 Improvements

Airports can enhance the management and coordination of the cargo logistics chain to improve logistics efficiency and shorten cargo time, allowing goods to be transferred through the airport more quickly. This can reduce dwell time and save costs. Airports can facilitate an increase in the number of flights, expand the route network coverage of airlines, attract more cargo business, increase cargo capacity, and realize rising benefits. Airports can seek partnerships with airlines and offer them certain benefits, such as airport service fees, that can help reduce cargo costs and attract airlines to our airport. Airports should purchase more advanced technological equipment when appropriate to handle cargo more efficiently and to reduce the use of consumables as much as possible to save costs. Airports should actively promote logistics-related businesses or diversify their business by establishing a new express logistics distribution center to increase revenue and reduce costs.

5.5 Route coverage

5.5.1 Results

The weighting of route coverage is the lowest and the score ranks second. The ranking of the indicator tier is: number of transit hubs > number of airline routes > destination coverage. cQ airport, as one of the eight regional hub airports in China, is highly rated by customers for its route coverage.

5.5.2 Improvements

Establish close partnerships with other airports for cargo, and increase their own coverage by expanding each other's network of waypoints to achieve route interoperability. Introduce new generation freighters suitable for cargo operations to increase load capacity and range and expand coverage. At the same time, the use of new, more fuel-efficient aircraft can also reduce operating costs. Provide low cost subsidies and incentives for cargo companies in the growth and development stages to attract them to use their own airports and drive passenger and cargo traffic growth. Expand visibility and influence through official websites, social media and other channels to let more potential customers know about their quality services and attract more external routes to come. Airport cargo should actively dock with the cargo source side and the receiving side to understand the needs of the logistics industry and provide logistics companies with systematic logistics solutions to meet customer needs. Optimize the training of frontline logistics staff, improve service standards and efficiency, and provide more professional cargo services to attract more private logistics companies and logistics giants to use the airport.

5.6 Service Quality

5.6.1 Results

Service quality was the only one of all dimensions that scored satisfactory for each indicator.

5.6.2 Improvements

Strengthen the professional skills training of freight personnel, such as customs clearance, loading and unloading, and other operational aspects of technology, as well as customer service in terms of communication skills and service awareness. Simulation drills on emergency handling and problem solving can also be conducted for freight personnel to improve service levels. By understanding customers' needs and feedback, continuously analyze and evaluate freight processes, check whether there are bottlenecks and inefficient links, and make timely improvements to optimize the logistics supply chain and speed up the flow of goods. Develop perfect service standards and indicators, establish a scientific assessment and evaluation system, monitor and track service quality in real time, adjust and correct deficiencies in a timely manner, and meet the ever-improving needs of customers on the basis of ensuring service quality.

6 Discussion

6.1 Conclusion

Air cargo is an important strategic resource for the country, with high value-added carriage of goods, fast and efficient features. With the shift of China's economy from the stage of high-speed growth to the stage of high-quality development, the development trend of air cargo specialization and logistics has put forward higher requirements on the layout, operating environment and efficiency of air cargo facilities. It is of certain theoretical and practical significance to construct an airport cargo service quality evaluation index system and explore the improvement path of airport cargo service quality.

This paper studies the improvement of airport cargo service quality as a new opportunity and growth point for development as a problem in the context of the rapid expansion and development of air cargo in China, and with the industry entering a new development opportunity period in the post-epidemic era. Through the analysis of the current situation and defects of CQ airport services, it is found that the current airport cargo service quality lacks an evaluation system, the deviation of service results does not effectively reflect the service quality, and it is difficult for the airport to obtain feedback from customers on the level of service quality, thus the necessity of establishing an airport cargo service quality evaluation system is proposed.

This paper combines the current situation of cargo business in CQ airport, screens and innovates service quality evaluation indexes by reading and analyzing literature and service process combing, in order to establish a scientific air cargo service quality index system, and finally determines the evaluation indexes including six evaluation dimensions and 18 evaluation indexes. The evaluation system is logical, comprehensive, and operable, and it takes into account the current development of the air cargo industry and its development trend, and it is more innovative to refine and increase the evaluation indexes that meet the characteristics of air cargo services in a more sustainable period of time in the future. The evaluation index system is used to investigate and evaluate the quality of cargo services at CQ airports.

In this paper, the analysis, research and evaluation methods are selected, combined with the characteristics of air cargo services, the expert scoring method is chosen as the data source and combined with the Analytic hierarchy process to determine the weight vectors of each dimension and indicator level, and a complete air cargo service quality evaluation index system is constructed, and a service quality questionnaire survey is designed and conducted based on this system. The fuzzy comprehensive evaluation method, which combines qualitative and quantitative evaluation, is

introduced to evaluate the questionnaire results, which reflects the service evaluation level of CQ airport in each dimension more objectively. According to the principle of maximum subordination, the fuzzy rubric for each level of CQ airport cargo service quality evaluation system was determined, and the scores assigned by the rubric can quantitatively reflect the evaluation level of the elements in the hierarchy. At the same time, it is refined to the index level to find the defects of CQ airport in service quality, and specific improvement strategies are proposed for the problems found.

6.2 The inadequacy of the paper

Due to the constraints of research time and my limited knowledge ability, the research in this paper has various flaws and shortcomings, which need to be improved and expanded in the subsequent research, mainly including the following points:

The research object of this paper is CQ airport, whose service process may be different from other airports and may not be applicable to all airport cargo business.

Due to my limited experience and knowledge system capability, the selected indicators and evaluation methods may be inadequate, which may have some influence on the accuracy of the results of this study.

6.3 Own learning

Through the writing of this thesis and field research, we have gained a deeper understanding of the processes and standards of airport cargo services, including how cargo is accepted, how it is handled, and how it is stored and transported safely. In the process of understanding the quality of airport cargo services, we have improved our ability to analyze and solve problems. Airport cargo service is a complex system that requires coordination and communication among various components. This field study helped us to understand the responsibilities of each link and improve our communication skills to better collaborate in completing our work. Airport cargo services involve several areas, such as aviation, logistics, and security management. Learning about the quality of airport cargo services helped us to expand our professional knowledge and skills in related areas so that we can better meet the challenges of my job.

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Appendices

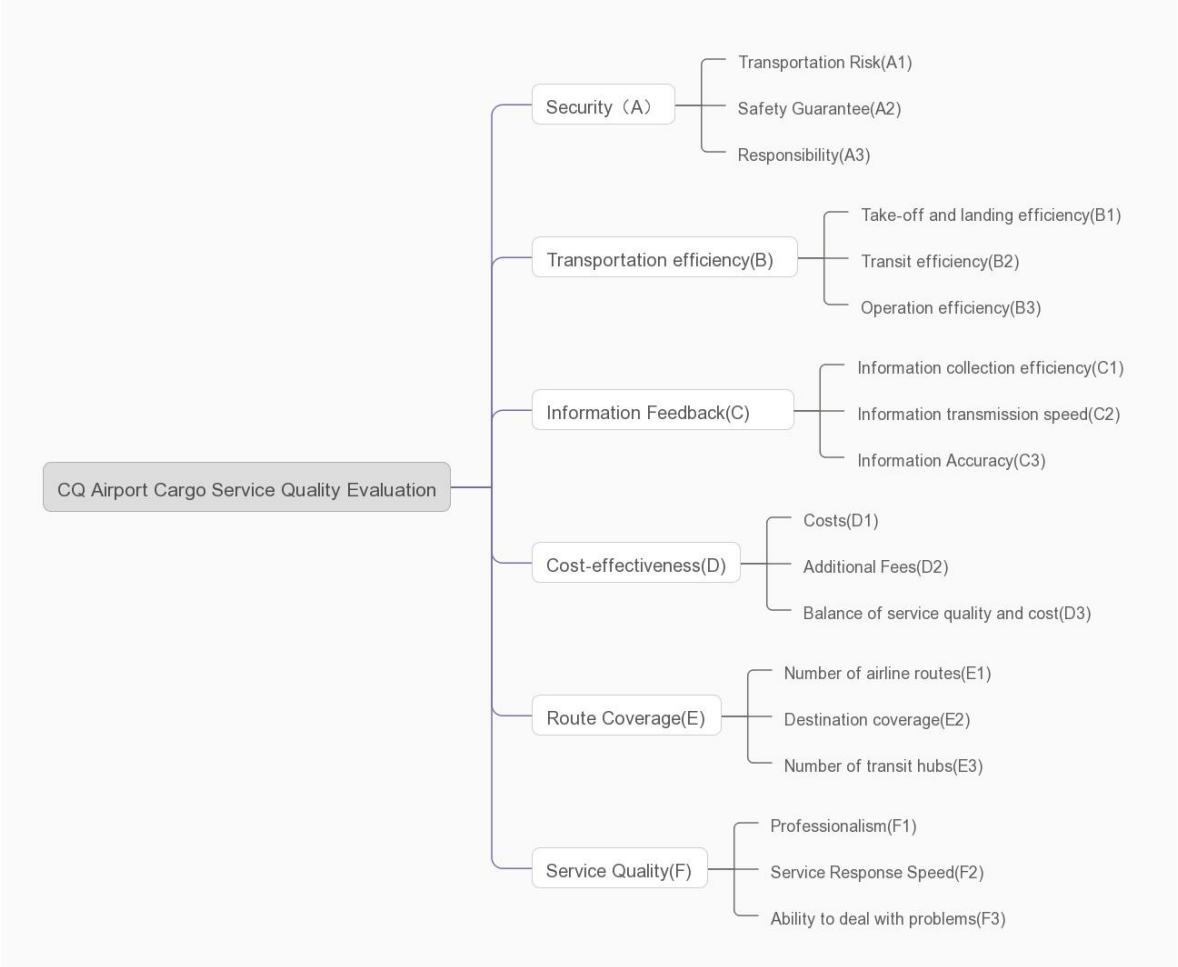
Appendix 1 Questionnaire on the weighting of indicators for evaluating the quality of cargo services dimensions at CQ airports

Dear air cargo experts:

This is a survey on the importance of evaluation dimensions and evaluation index weights for establishing a CQ airport cargo service quality evaluation index system, with the aim of establishing a suitable service quality evaluation system through your professional opinion. The results of this survey will be used for academic research purposes only and your information will be kept strictly confidential. Your opinion is very important for the development of this study. Thank you very much for your participation!

I. Questionnaire description

The objective of this study is to establish a CQ airport cargo service quality evaluation system, which contains a total of six evaluation dimensions, and each dimension contains three secondary evaluation indicators under each dimension, and its hierarchical relationship is as follows:



Ii. Questionnaire description

CQ airport cargo service quality evaluation agency selected 6 evaluation dimensions and 18 indicators. The process of weight comparison is divided into two stages: (1) comparison between evaluation dimensions; (2) Comparison between evaluation indicators contained in each dimension. The degree of importance is expressed as 1, 2, 3, 4, and 5, respectively representing "equally important", "slightly important", "important", "obviously important" and "very important". Important, very important. In the comparison matrix below, by default, the first column has the former dimension or metric, and the first row has the latter. If the latter is considered more important, use the reciprocal of the corresponding number.

Appendix 2 CQ airport cargo service quality survey questionnaire

Dear Madam/Sir,

Thank you for your continued support of CQ Airport's cargo business. In order to understand customers' evaluation on the cargo service quality of CQ Airport and improve the cargo service quality, this questionnaire survey was specially organized. This questionnaire is an anonymous survey for academic purposes only. Please fill in the questionnaire based on your true feelings about CQ Airport cargo services. Thank you for your support of this survey.

Questionnaire description: This survey consists of 22 questions, including 4 basic information and 18 service satisfaction questions. Please choose the option you think is appropriate.

1. Basic Information (Single Option)

1. Your gender: ()
A. Male B. female

2. Your age: ()
A.20-30 years old B.31-40 years old C.41-50 years old D.51-60 years old

3. Your Department: ()
A. Capacity purchasing B. Customer service C. Sales D. Field E. Management

4. Your rank: ()
A. Specialist B. Supervisor C. Department Manager D. Deputy General Manager E. General Manager

Ii. Freight service quality evaluation
1. Loss rate and breakage rate of goods. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

2. Precautions against transportation risks such as supervision of loading and unloading, luggage sorting, irresistible natural climate and plane crash at the airport. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

3. The airport's attitude towards responsibility and emergency response capacity after cargo accidents. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

4. Take-off and landing efficiency of airport flights. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

5. Airport transfer efficiency. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

6. Operation efficiency of the airport in flight scheduling, facilities and equipment, and the application of logistics information system. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

7. Airport information collection efficiency for passengers and cargo. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

8. Speed of transmission of business information processes of airport flight operation control and various security links. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

9. The cargo at the airport arrives on time according to the booked flight date and route.
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

10. Airports have lower shipping rates than other airports. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

11. Airports have clear standards for charging extra transport fees. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

12. Freight rates are set within a reasonable range, taking into account market conditions, competitive position and service level. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

13. The airport has multiple airline routes to meet your transportation needs. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

14. Airports have extensive coverage to meet your transportation needs. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

15.CQ Airport, as a transit hub for many airlines, can transfer cargo in large quantities and has an important air transport status and function. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

16. The staff has good expertise and skills throughout the transport process. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

17. Response time of airport staff to your inquiries, requests, cargo anomalies, claims, etc. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied

18. In airport cargo work, staff can always communicate well with customers. And staff can maintain friendly and professional communication in order to understand customer needs and solve possible problems. ()
A. Very dissatisfied B. Not satisfied C. average D. satisfied E. Very satisfied