WQ Airport Ground Logistics Service Quality Evaluation Application Study

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Abstract

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This thesis will collect the perception evaluation of the customers who have experienced WQ airport ground logistics through the questionnaire method, and analyze the results of the questionnaire to get whether the customers feel the service meets the expectation. Through the statistical analysis of the questionnaire, I will get their satisfaction and dissatisfaction with the ground logistics service of WQ airport. I will design the questionnaire based on the five dimensions of SERVQUAL model, and in this five dimensions, I will give suggestions on whether the service provided can meet the customer's needs and what is not done well.

Key words
SERVQUAL, Quality Service, Aviation Logistics

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1 Introduction

1.1 Research Background

With the increasing demand for domestic air cargo, the volume of air cargo at major airports in China is growing, but the domestic air cargo market still suffers from fierce competition among airports and a certain gap compared to foreign air cargo markets. Improving the quality of logistics services can bring more high added value to enterprises on the one hand, and enhance customer satisfaction, strengthen the trust of enterprises and improve their competitiveness on the other. At present, the domestic airport ground logistics service standards have not yet been formulated, but the study of airport air ground logistics service quality has become a hot spot for academics and enterprises.

Traditional air logistics often has complicated and numerous procedures and more transportation links compared to passenger transportation. Since cargo transportation destinations may not actively obtain and transmit information like passenger transportation, cargo transportation requires more manual intervention, which requires management and transmission of cargo information, and logistics information and transportation status must be communicated within the airline and through interaction with other parties involved in the transportation process. Improving the quality of logistics services can bring greater added value and diversified economic benefits to companies, while also increasing customer satisfaction and building trust and competitiveness. China has not yet developed comprehensive airport ground logistics standards, but research into airport ground logistics has become a focal point for academics and businesses.

Wanzhou Wuqiao Airport (later referred to as WQ Airport) is located in Wanzhou District, Chongqing, which was officially started in early 2000 and opened to traffic on May 29, 2003, with a runway of 2400 meters long and 45 meters wide. As of June 2020, Wanzhou Wuqiao Airport has a terminal building with an area of 5,780 square meters, a runway with a length of 2,800 meters, and 5 apron parking spaces. By March 2023, Wanzhou Wuqiao Airport will have 22 cities and 23 points of access. With the socio-economic development of Wanzhou and the positioning of Chongqing to build Wanzhou as the second largest city in its jurisdiction, Wanzhou airport has developed rapidly and continues to reach new historical highs, but compared with the city positioning, city and population scale, and radiation range of Wanzhou, Wanzhou airport is slightly lagging behind the development of the surrounding airports.

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In 2022, Wanzhou Wuqiao Airport handled 605,600 passengers, down 47.30% year-on-year; 763.11 tons of cargo and mail throughput, down 37.80% year-on-year; 7,788 landings and takeoffs, down 43.38% year-on-year. 763.11 tons of cargo and mail throughput were completed in 2022, down 463.89 tons compared with the same period in 2021. The cargo and mail throughput growth rate of Wanzhou Wuqiao Airport in 2022 ranked 108th in China, down 37.8% year-on-year.

The air cargo terminal is mainly responsible for ground logistics operations such as the handling and transportation of inbound and outbound cargo, and provides ground cargo handling and other related services for airlines. Although the volume of air ground logistics business at WQ airport is not very large, the airport has not formulated relevant control measures to standardize the management of cargo main body and ground service companies, resulting in relatively chaotic airport ground service management and low level of airport cargo.

For the cargo service industry, customer satisfaction is extremely important, so the airport needs to establish an air logistics service evaluation system on the basis of customer perception, evaluate the efficiency of air logistics ground service operation links, continuously regulate the airport ground aviation market and improve the ground logistics service.

1.2 Research Objectives

This thesis analyzes whether the ground logistics service of WQ airport meets the expectation by conducting a questionnaire survey on the customers who have experienced the ground logistics service of WQ airport, and proposes improvement suggestions for those who do not do well.

The questionnaire was designed according to the five dimensions of SERVQUAL model, the collected data were statistically analyzed, and the SPSS software was used to analyze and test the reliability and validity of the questionnaire data. Based on the data after the calibration was completed, the ground logistics service quality of WQ airport was evaluated, and the perception-expectation gap analysis method was used to make a comprehensive evaluation of

the ground logistics service quality of this airport, and the evaluation results were analyzed and conclusions were obtained.

2 Theoretical Framework

2.1 Service quality

As far as quality management practices in the service industry are concerned, most of them were explored based on quality management theories in the manufacturing industry. In the 1970s, along with the full unbundling of the service industry, some scholars realized the differences between services and products and believed that service quality could not be equated with product quality. And service quality is not only related to the result, but also closely related to the service process.(Baohui 2000, 20-23)

Service quality must be based on the basis of customer perception, which is a comparison between the expectations and the actual perceptions that customers hold about the service. If the latter is higher than the former, then the customer's perception of service quality is good, and the opposite is poor. The determinants of customer expectations include customer demand, corporate image, word of mouth and marketing communication. There are two types of service quality: functional quality and technical quality (P'arasuraman A. et. al, 1994).

Service is in fact a process consisting of a series of non-formal activities. The process takes place in an interactive environment consisting of the creator of the service, the recipient and the tangible medium. The purpose of the service is to solve problems for the customer receiving the service, to satisfy the customer's needs, and to create value. Since then, academic research has been conducted on service quality models. (Gronroos 1984, 36-44).

Service quality is not entirely determined by the company, but is closely related to the subjective perception of the customer, which depends on the difference between the service quality expected by the customer and the level of service actually perceived by the customer, i.e. the quality of the customer experience. Therefore, service quality can be considered as a subjective category. (Chang Hao 2014,69-72)

2.2 Airport ground logistics services

Airport ground logistics service refers to the ground handling services such as passenger and baggage, cargo and mail, ramp, loading and unloading and ground transportation within the scope of civil airports. Airport ground logistics services are not only related to aviation safety, but also have an important impact on the efficiency and level of airline and aviation consumer services, and are an important part of air transportation management. (Li zhangping 2021, 11-12)

Airport ground logistics service refers to the service process between the transport links from the place of shipment and the place of receipt to the airport. Airport ground logistics is composed of three parts: air cargo forwarding enterprise, ground transportation enterprise and airport cargo terminal. In the airline service system, except for the airlines, all of them belong to the ground logistics part. Before the air cargo enters the airport of departure, almost all operations are handled by the air freight forwarder, including the concentration of scattered cargoes, documentation, organization of ground transportation and temporary storage, etc.; the airport cargo station is mainly engaged in loading and unloading, security inspection, aircraft take-off and landing; the airline company provides air transportation services. (Foresight Economist 2022)

Like the traditional logistics industry, air logistics also has the basic characteristics of modern logistics, these characteristics mainly include packaging, warehousing, distribution and other services, in addition to air logistics has its own characteristics, namely, point-to-point air carrier, fast speed, short time, customs clearance, customs clearance, etc.. It can cover the whole process of physical flow of consignments from the place of shipment to the place of acceptance. (Huang Wen 2011, 12-21)

Since air logistics is a latecomer in the modern logistics arena, it does not account for a large share of the overall logistics industry, but its own characteristics determine the need for high safety requirements, and its timeliness, strong value-added, these characteristics determine the important position of air logistics in the modern logistics industry. The personalized and lean services, combined with its speed, wide coverage and capacity coordination, determine its huge competitive advantages and potential in the fields of customer service, revenue management and supply chain services. (Yin 2014, 51-53)

Aviation ground logistics has a strong customer involvement. Customer participation is the primary characteristic of ground logistics. Aviation logistics ground service chain of customers but is located at both ends of the aviation logistics chain, which objectively requires ground logistics to synchronize information communication with customers at both ends of the and multi-point two-way contact, in order to achieve a rapid response to customer service needs. Aviation ground logistics has a systematic nature. Transportation, storage, packaging and distribution are the basic links of logistics and the actual executors of logistics system, which constitute the basic needs of logistics industry. From air freight forwarding to ground transportation enterprises to complete these tasks must work closely together in order to efficiently provide services to customers. Air ground logistics has complete responsiveness to customer needs. From the type of logistics service chain, ground logistics service is a typical

demand-based supply chain. The non-storable and non-transferable characteristics of aviation logistics determine that there can be no "inventory" produced and stored in advance, therefore, aviation ground logistics is necessarily demand-driven. Without customer demand, the service of each link will have no object, and a series of operations in the service chain will not occur. (Liu Siqi 2012, 5-6)

2.3 Logistics Service Quality Evaluation

Evaluate the quality of logistics services, usually according to the following aspects. Service scope and coverage: Evaluate the service scope and coverage of the courier company, including the countries and regions served, the scope and speed of delivery, etc. Reliability and punctuality: Evaluate the reliability and punctuality of the courier company, including whether the courier arrives on time, is delivered on time, and whether there is damage or loss. Customer service and communication ability: Evaluate the customer service and communication ability of the courier company, including the quality of customer service, response speed, efficiency and ability to handle customer problems, etc. Parcel tracking and information disclosure: evaluate the parcel tracking and information disclosure of the courier company, including the accuracy, timeliness and transparency of tracking information, etc. Cost-effectiveness: Evaluate the cost-effectiveness of the courier company, including whether the courier cost is reasonable, whether there are extra costs, whether there are preferential policies, etc. (Wei ping 2022, 50-51)

The purpose of logistics service quality assessment research is to improve the management of customer service of logistics enterprises, to study the level of customer service of logistics enterprises must be a systematic analysis of customer service of logistics enterprises, to clarify the relevant concepts, in order to ensure the correctness and relevance of the study. The definition of logistics service quality varies from organization to organization. Logistics companies and their customers may have a different understanding of the definition of customer service. Customer service, when used effectively, is the primary variable that can have a significant impact on creating demand and maintaining customer loyalty. Broadly speaking, customer service can measure how well a logistics system provides time and place utility for a product or service. It includes behaviors such as easing the workload of inventory reviews, ordering, and after-sales service. (Li Weihua 2010, 99-100)

To assess the quality of logistics services, a specific set of quality indicators needs to be defined. The system of indicators should basically cover all aspects related to the quality of logistics services. After discussing the traditional logistics service level assessment indicators, it is interesting to compare these indicators with the factors influencing logistics service level

provided by the PZB (Parasuraman-Zeitham1 -BerryModel 1991) model; the comparison will reveal the specific characteristics of the assessment indicators in practical application. The PZB model proposes some factors related to logistics service level, which are mainly reflected in the following five aspects.

1. Practicability, which refers to the readiness of material materials, tools and equipment, personnel and communication means for logistics services to be practical and operational.

2. Reliability, refers to the ability to let customers feel confident, accurate and timely completion of.

3. Responsiveness, the degree of willingness to help customers and provide immediate service.

4. Insurance, which refers to the knowledge and courtesy of the employees involved in logistics services and their ability to convey trust and confidence.

5. Persistence, which refers to the special attention that the company offers to the customer, tending to sympathize with the customer, alone.

Between the two sets of parameters, they are analyzed using strong and weak relationships that are combined and related to each other. A strong relationship is the existence of a strengthened connection between the PZB model factors and traditional logistics service evaluation indicators, while a weak relationship is a weak connection. Usually, it is impossible to identify one-to-one correspondence between PZB model factors and logistics service indicators, so it is conceivable that one logistics service indicator can interact with multiple PZB model factors. (Zhang Changgen 2002, 74-76)

Although many scholars use the SERVQUAL scale for airports, Wang Linlin (2016) uses AHP to establish an evaluation index system, and lists 29 indicators to evaluate the service quality of Guizhou airports in five dimensions: transfer level, lounge level, safety level, personnel service level, and facility level. (Zhang Lili 2017, 62-63)

Relevant research is still in the stage of theoretical analysis, and quantitative analysis based on data is relatively lacking. The studies on air ground logistics service quality are based on SERVQUAL evaluation method, which uses factor analysis and hierarchical analysis to determine the weights of multi-level service quality indicators, which are used as the basis for evaluating and comparing aviation logistics service quality and putting forward relevant decisions and suggestions. (Liu Jing 2020,32-33)

Compared with domestic research, in overseas research on air logistics quality service, although some scholars take SERVQUAL evaluation method as the basis, most scholars take air logistics business as the main research object, and study the characteristics, problems and development direction of air logistics business, such as the problems and countermeasures faced by air cargo logistics business, or take The perspective of customer perception, measuring the feelings of customers as a perspective to express their views. A combination of quantitative and qualitative methods can be further used to evaluate the level of airport logistics services. (Tian Xue 2018, 50-56)

2.4 Overlay matrix

Table 1 . Overlay matrix (adapted from Peltonen 2017,3)

Investigative questions	Chapter	Results	Questionnaire questions
Tangibility: Tangibility refers to the perceived part of the service, such as the various airport facilities used to provide the service.	3-4	Chapter 4 and Figure 2	1-3
Reliability: Reliability refers to the ability to perform the promised airport services accurately and without error.	3-4	Chapter 4 and Figure 3	4-7
Responsiveness: Responsiveness refers to the ability of an airport to be ready to provide fast and efficient service to its customers.	3-4	Chapter 4 and Figure 4	8-11
Assurance: Assurance refers to the friendly attitude and competence of airport personnel, which enhances the customer's confidence and security in the quality of the company's services	3-4	Chapter 4 and Figure 5	12-16
Empathy:Empathy means that the airport should genuinely care about its customers and give them special attention.	3-4	Chapter 4 and Figure 6	17-20

3 Empirical studies

In this part, the dimensions of the evaluation index system are determined according to the generality of SERVQUAL model, and the indicators of the evaluation system are determined based on the previous research of experts and scholars, combined with the relevant situation of ground logistics in WQ airport, to determine the questionnaire topics and under the advice of relevant experts. After that, the collected data will be statistically analyzed, and the index system will be adjusted and analyzed for reliability by SPSS software, and the weights of the evaluation index system (questionnaire questions) will be determined by regression analysis to complete the construction and calibration of the evaluation index system.

3.1 Study methods

SERVQUAL is applied to measure the service quality of information systems and is a useful tool for assessing service quality and identifying actions to improve it. Over the past decade, the model has been widely accepted and adopted by managers and researchers. SERVQUAL theory is a new service quality evaluation system proposed by PZB for the service industry in the late 1980s, which states that service quality depends on the difference between the level of service perceived by consumers and the level of service expected by consumers, i.e., the difference between what customers expect from the service quality and what they get from It is called the "expectation-perception" model. SERVQUAL divides service quality into five dimensions, they are Tangibility, Reliability, Responsiveness, Assurance, Empathy, each of which is divided into a series of 22 specific questions, and users rate their expected score, actual perceived score and minimum acceptable score through a questionnaire. (PZB, 1988, 12-40)

According to the SERVQUAL model evaluation scale, a questionnaire was used to survey and study service companies in various industries, and respondents would score their expected corporate services from high to low on a satisfaction scale of 1 to 5. The same for the perceived value of the actual services scored. The difference between the Expectation score and the Perception score is defined as the service quality variation score.

$$SQ = \sum_{j=1}^{n} W_j \sum_{i=1}^{R} W_{ji} (\bar{P}_i - \bar{E}_i) \quad (1)$$

where,

SQ --the overall service quality under the expected perceived differences.

$\overline{P_i}$ --mean value of service quality of the ith indicator as perceived by the consumer for the actual perception.

$\overline{E_i}$ --mean value of service quality of the ith indicator expected by the consumer.

W_j ---weights of each dimension

W_{ji} --the i-th weight in the j-th dimension

n --the number of dimensions

R --number of items under each dimension

If SQ>0, the respondent's perception of the service is higher than expected, i.e. the quality of the service exceeds expectations, the respondent is very satisfied with the company;

If SQ=0, the respondents' perception of the service is the same, then the service quality has reached the expected level of water customers;

If SQ<0, the respondents' perception of the service is lower than expected, i.e. the service quality is lower than the expected level of the customer, then the respondents are not satisfied with the company and the company should consider improving the service quality.

3.2 Data Collection

3.2.1 Distribution of questionnaires

In the design of questionnaire items, I mainly borrowed the more mature questionnaire scale from scholars and designed a questionnaire with 20 questions for each index.The reference sources of the questionnaire items are shown in Table 2.

Table 2. Questionnaire questions

Dimension	Topic No.	Questionnaire questions	Source
Tangibility	A1	Adequate number of airport cargo terminals	Guan Na (2009)
	A2	Airport loading and unloading equipment level	Zhong Polan (2011)
	A3	Airports have efficient security screening equipment	Bai Yang (2012)
	B1	Quality of assembly of outbound cargo	Tian, Xue (2018)

Reliability	**B2**	The airport is able to record the relevant services correctly	SERVQUL model metric
	B3	The airport completes what it promises to customers in a timely manner	SERVQUL model metric
	B4	The airport gives priority to the customer's interests	Field survey
Responsiveness	**C1**	Speed of updating airport information	Zhang, Mei (2013)
	C2	Speed of sorting cargo at the airport	Zhang, Mei (2013)
	C3	Airport gives feedback on customer complaints	Zhang, Mei (2013)
	C4	Efficiency of airport outbound assembly	Wei Ran (2008)
Assurance	**D1**	Airport can compensate customers' loss in time	Field survey
	D2	Staff can provide better service	SERVQUL model metric
	D3	High quality of airport logistics staff	Field survey
	D4	The adequacy of the airport's number of relevant professionals	Xue-Gang Shi (2014), Mei Zhang (2013)
	D5	Whether the airport can provide personalized services to customers	Field survey
Empathy	**E1**	Airport staff can provide good care to customers	Field survey
	E2	Employees are polite	Field survey
	E3	The airport can train its staff to serve customers better	Xue-gang Shi (2014), Mei Zhang (2013)
	E4	The airport's logistics service rules and regulations are sound and reasonable	Research Summary

3.2.2 Recall of questionnaires

The questionnaire uses a Likert scale with 5 questionnaire options, 1, 2, 3, 4, 5, with a score of 1-5 indicating very poor, poor, general, good, and excellent, and the respondents will be scored according to their satisfaction with the airport (Likert scale, 1932). The questionnaire is a web-based questionnaire, using Questionnaire Star to create the questionnaire, through the Internet multimedia media, such as QQ, WeChat, asking people who have experience with WQ airport logistics services (customers who have performed baggage handover, baggage cargo transportation, baggage security services, cargo and mail inbound and outbound services at the airport), and distributing the electronic version of the questionnaire to them by email. At the same time, field research was conducted and questionnaires were distributed at the airport, which were collected both online and offline to make the sample wide, so that the validated evaluation index system has some general applicability. A total of 120 questionnaires were distributed, 110 were returned, with a return rate of 83.3%, and 100 valid questionnaires were selected, with a valid rate of 90.1%.Table 3 lists the dates and completion times of the questionnaires for some of the investigators.

Table 3. Information about the survey

Respondent	Answer Date	Answer Time	Answer Location
1	2023/3/20 16:17:22	183 s	Questionnaire Star
2	2023/3/20 16:19:11	156 s	Questionnaire Star
3	2023/3/20 16:21:33	101 s	Questionnaire Star
4	2023/3/20 16:23:41	110 s	Questionnaire Star
5	2023/3/20 16:27:37	151 s	Questionnaire Star
6	2023/3/20 16:31:06	188 s	Questionnaire Star
7	2023/3/20 16:32:50	129 s	Questionnaire Star
8	2023/3/20 16:34:58	120 s	Questionnaire Star
9	2023/3/20 16:36:59	170 s	Questionnaire Star
10	2023/3/20 16:44:16	113 s	Questionnaire Star

3.3 Questionnaire reliability test and validity test

3.3.1 Reliability test

The reliability test focuses on the consistency and reliability of the measurement scale. Cronbach's Alpha is a value between 0 and 1, which represents the internal consistency of the scale, i.e., the degree of correlation between the questions of the scale, and the higher the value, the higher the reliability of the scale. In general, a Cronbach coefficient above 0.6 is considered to have reliability, and a coefficient of 0.7 or above indicates a high reliability of the scale.

In the following, the Cronbach's Alpha coefficient is used to measure the reliability. The data were imported into SPSS, and the alpha coefficients were calculated to be greater than 0.6, indicating that the questionnaire is credible. There is a good correlation between the dimensions and the overall, and the internal consistency is good, so it passes the reliability test and can be further analyzed for validity. This process was implemented in SPSS software. The results of the test are shown in Table 4.

Table 4. Cronbach's Alpha coefficient of each dimension

Dimension	Cronbach's Alpha	Number of questions
Tangibility	.859	3
Reliability	.852	4
Responsiveness	.864	4
Assurance	.886	5
Empathy	.849	4

3.3.2 Validity tests

KMO test and Bartlett's sphericity test:

(1) KMO test. It is used to check the bias correlation between variables and takes a value between 0 and 1. The closer the KMO value is to 1, the stronger the bias correlation between variables and the better the factor analysis effect. KMO value above 0.9 is extremely suitable for factor analysis, above 0.8 is suitable for factor analysis, above 0.7 is okay, above 0.6 is barely okay, above 0.5 is unsuitable, and below 0.5 is very unsuitable. In practical use, above 0.7, the effect is relatively good below 0.5, not suitable for the application of factor analysis.

(2) Bartlett's spherical test. P<0.05, does not obey the spherical test, that is, there is a strong correlation between the variables; P>0.05, obeys the spherical test, the variables are independent of each other, can not do factor analysis.

Table 5. Validity test success criteria

Test category	Range of values	Factor analysis suitability
KMO value	＞0.9	Ideal for
	0.8~0.9	Very suitable
	0.7~0.8	Suitable
	0.6~0.7	Barely suitable
	0.5~0.6	Not quite suitable
	＜0.5	Unsuitable
BartlettP value	≤0.01	Suitable

The KMO and Bartlett's test were conducted on the questionnaire indicators, and as shown in Table 5, the KMO value was 0.94 and Bartlett's sphericity check was 1874.025, and it was significant at the level of 0.000, indicating that the study sample data were suitable for factor analysis. The results of the test are shown in Table 6.

Table 6. KMO test and Bartlett's test

KMO and Bartlett Calibration	
KMO	.940
Bartlett	1874.025
Sig.	.000

3.4 Determination of the weights of the evaluation index system

3.4.1 Determining dimension weights

Determining dimensions and indicators requires determining their weights. Weights are the determination of their importance. Since the importance of each dimension and indicator varies when evaluating multiple indicators, an objective assessment is possible only if their weights are determined scientifically.

Summarizing the literature of experts and scientists to date, several methods of determining weights can be identified, including principal component analysis, hierarchical analysis, and regression analysis. Starting from the data itself, the dimensions of the evaluation index system and the weights of the indicators must fully reflect the expectations of customers. The regression analysis method determines the regression equation by analyzing the quantitative correlation coefficients between the dependent and independent variables, and determining the weights according to the degree of influence of each variable, as well as the weights of the evaluation index system in this thesis. Therefore, the weights in this work are determined by the regression analysis method.his process was implemented in SPSS software. As shown in Table 7.

Table 7. Regression analysis table for each dimension

Dimensions	Unstandardized	Sig.

	Coefficients (B)	
Tangibility	2.583	.000
Reliability	2.961	.000
Responsiveness	3.864	.000
Assurance	2.773	.000
Empathy	2.350	.000

(1) Determining the regression equation

As known from Table 5, the regression coefficients for each dimension can be obtained as 2.483 for tangibility, 2.961 for reliability, 3.864 for responsiveness, 2.773 for assurance, and 2.350 for empathy. From the above, significance of 0.000 means the data are valid. Service quality can be expressed as SQ, then:

$$SQ = 2.483 \times A + 2.961 \times B + 3.864 \times C + 2.773 \times D + 2.350 \times E \quad (2)$$

(2) Normalization process

Normalization is about taking the data that needs to be processed and limiting it to a certain range that you need.The final weights of each dimension need to be normalized to obtain them.Here each data will be used to divide the total data.

Weights of Tangibility:

$$A = 2.483 \div (2.483 + 2.981 + 3.864 + 2.773 + 2.350) = 0.172 \quad (3)$$

Weighting of Reliability:

$$B = 2.961 \div (2.483 + 2.961 + 3.864 + 2.773 + 2.350) = 0.205 \quad (4)$$

Weight for Responsiveness:

$$C = 3.863 \div (2.483 + 2.961 + 3.864 + 2.773 + 3.350) = 0.268 \quad (5)$$

Weight of Assurance:

$$D = 2.773 \div (2.483 + 2.961 + 3.864 + 2.773 + 2.350) = 0.192 \quad (6)$$

Weight of Empathy:

$$E = 2.350 \div (2.483 + 2.961 + 3.864 + 2.773 + 2.350) = 0.163 \quad (7)$$

3.4.2 Determining indicator weights

Taking Tangibility A as an example, the weights of each indicator under Tangibility are determined using the method of determining dimensional weights. As shown in Table 8.

Table 8. Regression analysis table for Tangibility

Coefficient[a]		
Dimensions	**Unstandardized Coefficients (B)**	**Sig.**
A1	-.567	.000
A2	-1.364	.000
A3	-.769	.000

a. Dependent variable: Tangibility

As known from Table 8, the regression coefficients for each dimension can be obtained as -0.567 for A1,-1.364 for A2, -0.769 for A3. From the above, significance of 0.000 means the data are valid. Then:

(1) Regression equation:

$$\mathrm{A} = \text{-}0.567 \times A1 \text{-} 1.364 \times A2 \text{-} 769 \times A3 \quad (8)$$

(2) Normalization process:

Adequate number of airport cargo terminals (A1) weight:

$$\mathrm{A1} = \text{-}0.567 \div (\text{-}0.567 \text{-} 1.364 \text{-} 0.769) = 0.210 \quad (9)$$

Airport loading and unloading equipment level (A2) weight:

$$A2 = -1.364 \div \left(-0.567 - 1.364 - 0.769\right) = 0.505 \quad (10)$$

Airports have university security screening equipment (A3) weight:

$$A3 = -0.769 \div \left(-0.567 - 1.364 - 0.769\right) = 0.285 \quad (11)$$

The weights of the different indicators under the latter four dimensions are calculated in the same way. The final calculation results will be shown in Table 9 and Figure 1.

Table 9. WQ airport ground logistics service quality index

Dimension	No.Question No.	Questionnaire questions	Weight
Tangibility A (0.172)	A1	Adequate number of airport cargo terminals	0.210
	A2	Airport loading and unloading equipment level	0.505
	A3	Airports have efficient security screening equipment	0.285
Reliability B (0.205)	B1	Quality of assembly of outbound cargo	0.211
	B2	The airport is able to record the relevant services correctly	0.225
	B3	The airport completes what it promises to customers in a timely manner	0.297
	B4	The airport gives priority to the customer's interests	0.267
Responsiveness C (0.268)	C1	Speed of updating airport information	0.216
	C2	Speed of sorting cargo at the airport	0.282
	C3	Airport gives feedback on customer complaints	0.318
	C4	Efficiency of airport outbound assembly	0.184
Assurance D (0.192)	D1	Airport can compensate customers' loss in time	0.442
	D2	Staff can provide better service	0.143
	D3	High quality of airport logistics staff	0.041
	D4	The adequacy of the airport's number of relevant professionals	0.089
	D5	Whether the airport can provide personalized services to customers	0.285
Empathy E (0.163)	E1	Airport staff can provide good care to customers	0.208
	E2	Employees are polite	0.224
	E3	The airport can train its staff to serve customers better	0.257
	E4	The airport's logistics service rules and regulations are sound and reasonable	0.311

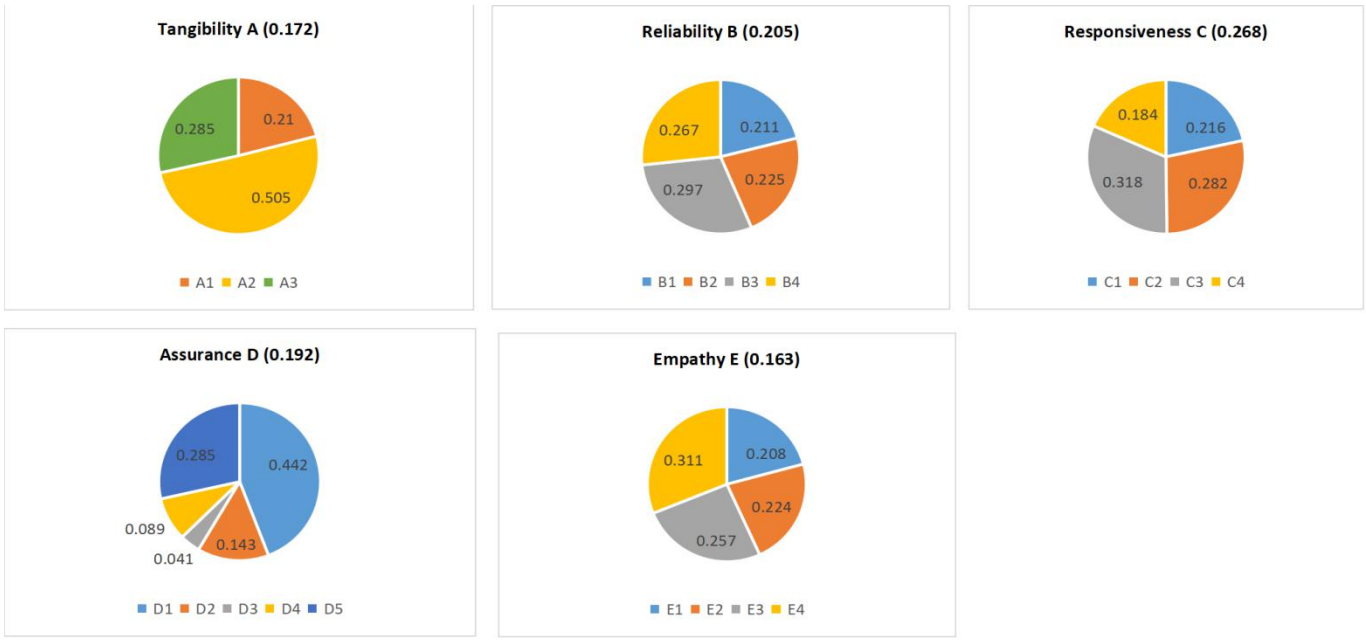


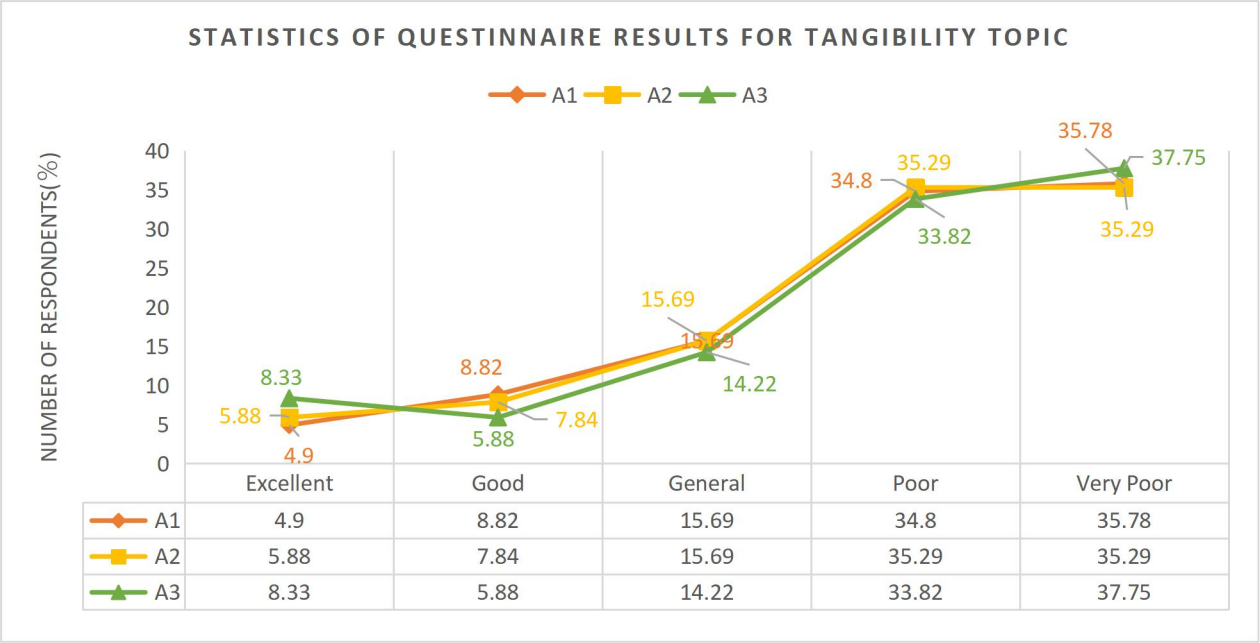
Figure 1. WQ airport ground logistics service quality index

In summary, the weight of Tangibility is 0.172, Reliability is 0.205, Responsiveness is 0.268, Assurance is 0.192, and Empathy is 0.163, the sum is 1. Also, the topics under each dimension are calculated separately, and the weights of topics under each dimension sum up to 1.

4 Results

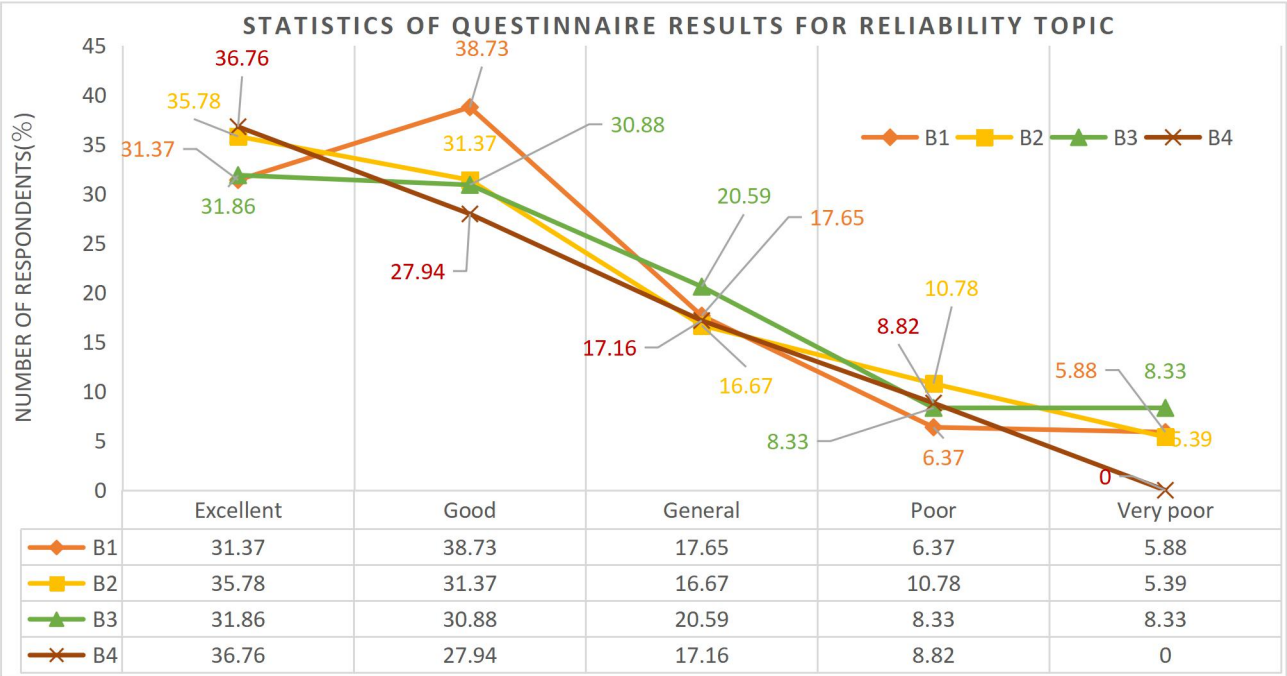
4.1 Questionnaire results

This element focuses on what percentage of respondents chose what options for the different questions after completing the questionnaire.The results of the questionnaire are shown in the following Figures.



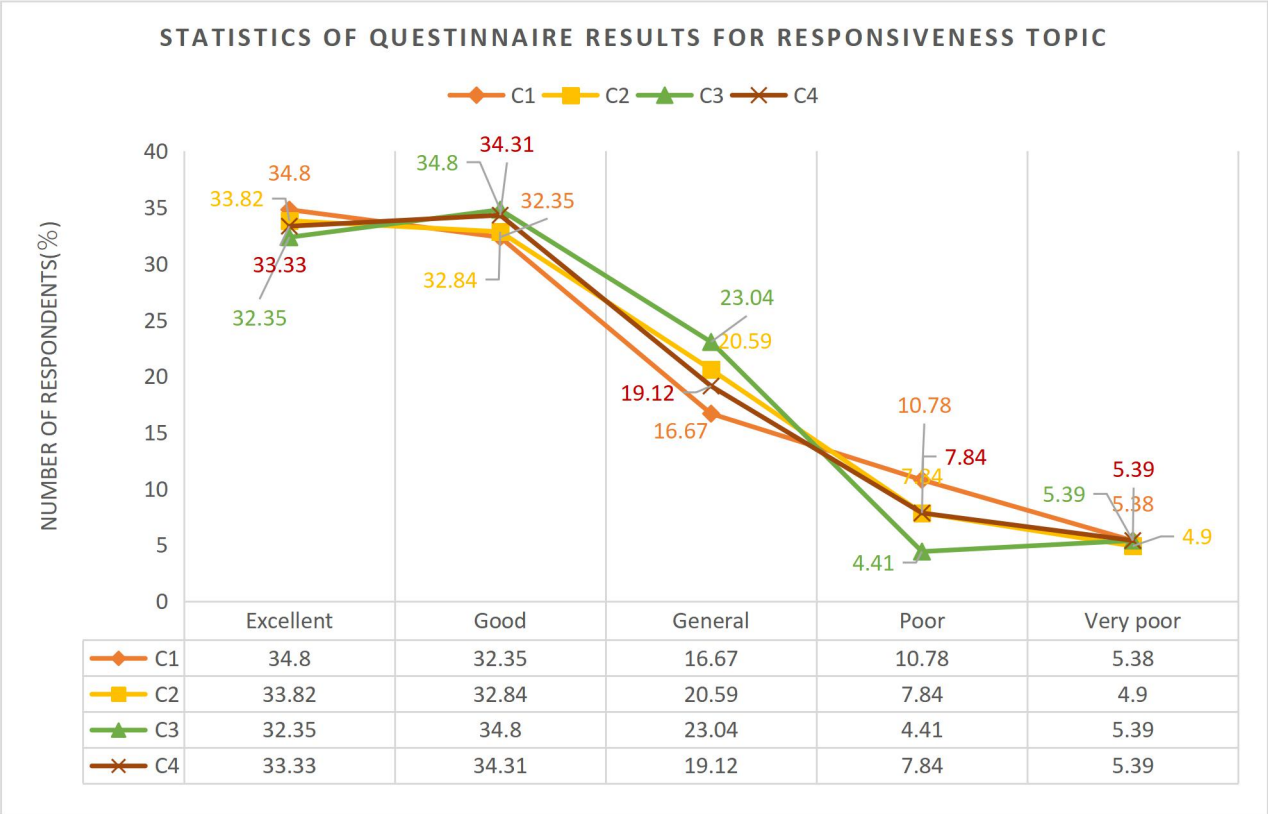
	Excellent	Good	General	Poor	Very Poor
A1	4.9	8.82	15.69	34.8	35.78
A2	5.88	7.84	15.69	35.29	35.29
A3	8.33	5.88	14.22	33.82	37.75

Figure 2. Statics of questionnaire results for Tangibility Topic



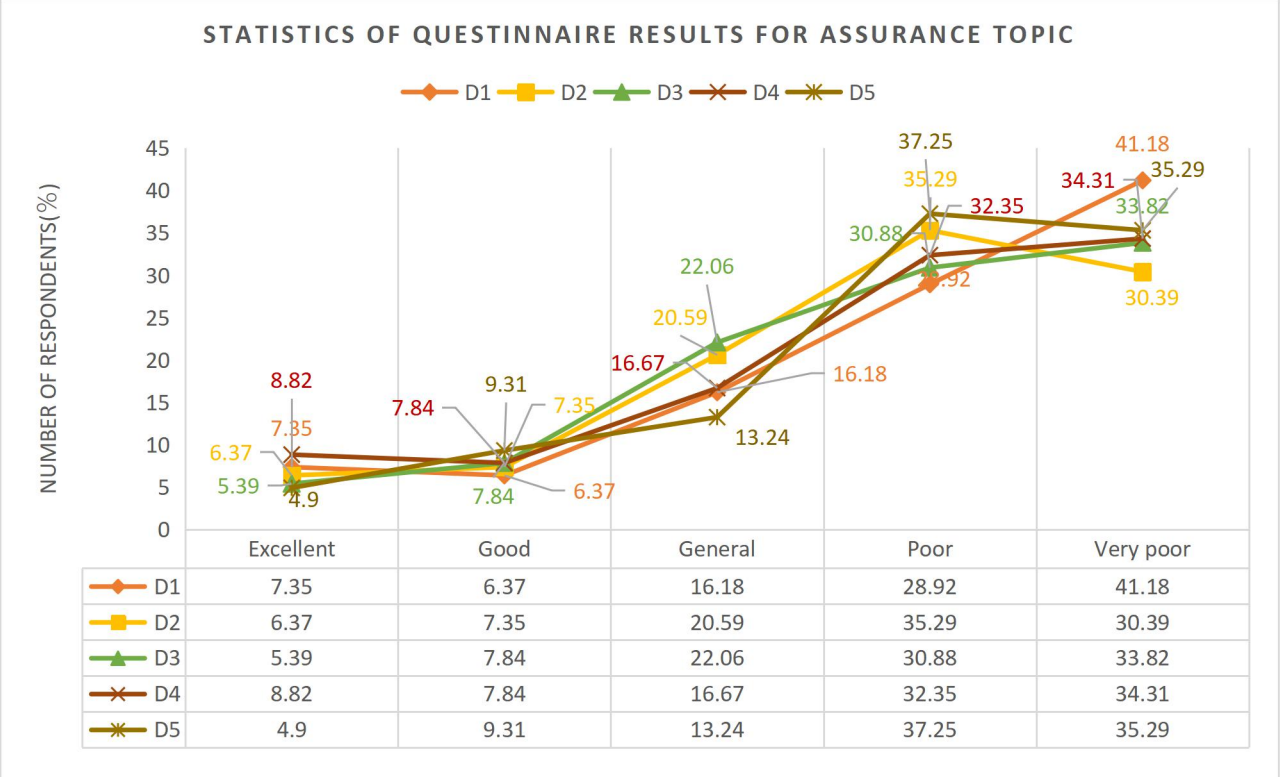
	Excellent	Good	General	Poor	Very poor
B1	31.37	38.73	17.65	6.37	5.88
B2	35.78	31.37	16.67	10.78	5.39
B3	31.86	30.88	20.59	8.33	8.33
B4	36.76	27.94	17.16	8.82	0

Figure 3. Statics of questionnaire results for Reliability Topic



	Excellent	Good	General	Poor	Very poor
C1	34.8	32.35	16.67	10.78	5.38
C2	33.82	32.84	20.59	7.84	4.9
C3	32.35	34.8	23.04	4.41	5.39
C4	33.33	34.31	19.12	7.84	5.39

Figure 4. Statics of questionnaire results for Responsiveness Topic



	Excellent	Good	General	Poor	Very poor
D1	7.35	6.37	16.18	28.92	41.18
D2	6.37	7.35	20.59	35.29	30.39
D3	5.39	7.84	22.06	30.88	33.82
D4	8.82	7.84	16.67	32.35	34.31
D5	4.9	9.31	13.24	37.25	35.29

Figure 5. Statics of questionnaire results for Assurance Topic

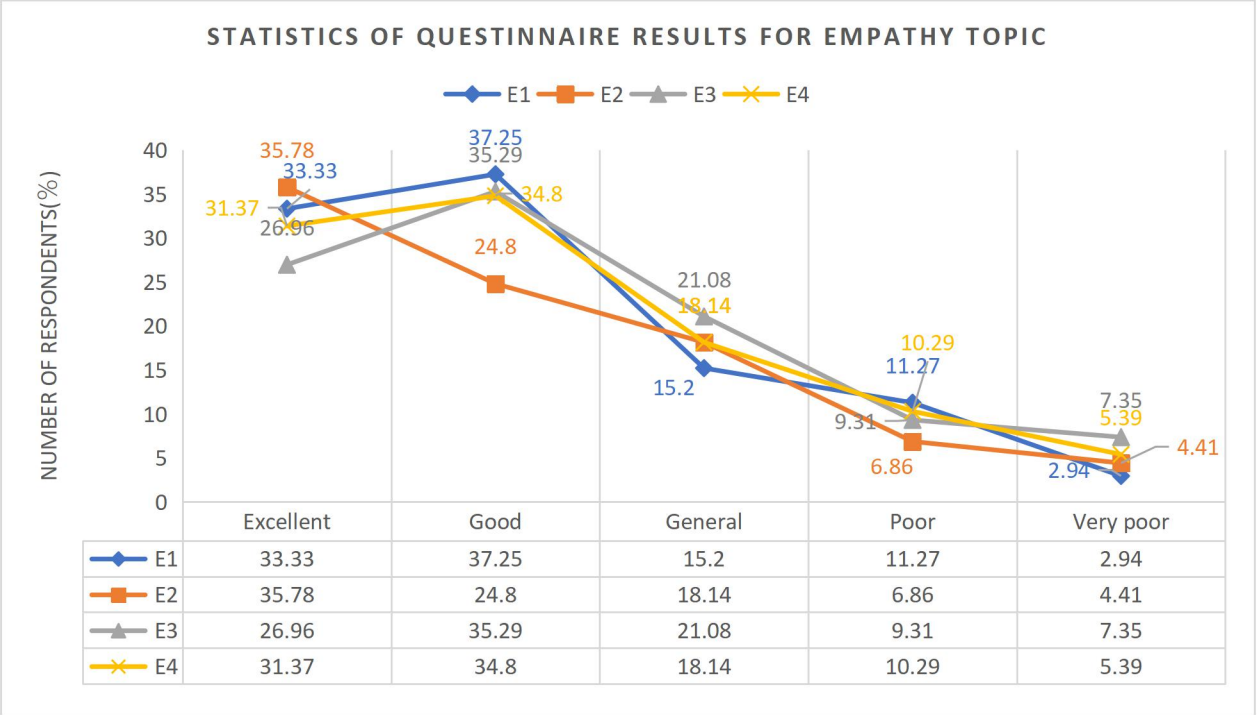


Figure 6. Statics of questionnaire results for Empathy Topic

From the results above, it can be seen that in the tangibility dimension, about 60 percent of the respondents thought that the airport did a poor or very poor job in tangibility, with a small difference in the percentage of people choosing different options for each question. In the Reliability, Responsiveness, and Empathy dimensions, more than half of the respondents thought the airport did a good job in this area, and a very small percentage thought the airport did a poor job, with similar results for all three dimensions. In the assurance dimension, nearly half of the respondents thought the airport was doing a poor job in this area, making it the highest percentage of the five dimensions.

4.2 WQ Airport Ground Logistics Service Quality Application

4.2.1 WQ Airport Ground Logistics Service Quality Expected Mean Value

In this section, to derive the expected values, I will calculate the average value of customer expectations for each issue through the actual data obtained from the questionnaire. The analysis is shown in Table 8.

Table 8. Expected mean value of ground logistics service quality at WQ airport

NO.	Questionnaire questions	Max.	Min.	Average	Sorting
A1	Adequate number of airport cargo terminals	5	2	4.27	11
A2	Airport loading and unloading equipment level	5	3	3.59	17
A3	Airports have efficient security screening equipment	5	3	4.59	6
B1	Quality of assembly of outbound cargo	4	1	3.21	19
B2	The airport is able to record the relevant services correctly	5	4	4.23	12
B3	The airport completes what it promises to customers in a timely manner	4	1	3.56	18
B4	The airport gives priority to the customer's interests	5	4	4.30	10
C1	Speed of updating airport information	5	3	4.68	5
C2	Speed of sorting cargo at the airport	5	4	4.21	13
C3	Airport gives feedback on customer complaints	5	3	4.51	7
C4	Efficiency of airport outbound assembly	4	1	3.13	20
D1	Airport can compensate customers' loss in time	4	2	3.63	16
D2	Staff can provide better service	5	4	4.19	14
D3	High quality of airport logistics staff	5	4	4.79	3
D4	The adequacy of the airport's number of relevant professionals	5	4	4.38	8
D5	Whether the airport can provide personalized services to customers	5	4	4.79	2
E1	Airport staff can provide good care to customers	5	4	4.33	9
E2	Employees are polite	5	4	4.80	1
E3	The airport can train its staff to serve customers better	5	4	4.69	4
E4	The airport's logistics service rules and regulations are sound and reasonable	5	2	4.01	15

After statistical analysis, the average score of respondents' expectations for each indicator under the index system is relatively high, basically above 4, which shows that the respondents' expectations for WQ airport logistics services are very high. According to the table, it can be seen that the difference between the maximum mean value and the minimum mean value is 1.666, where the maximum is 4.80 and the minimum is 3.13, which indicates that the expectation of WQ airport ground logistics is higher in general, and they hope the airport will bring high quality services.

The top five in the ranking of WQ airport ground logistics service expectation quality from highest to lowest are: E2,D5,D3,E3,C1. The bottom five in the ranking are: D1,A2,B3,B1,C4.

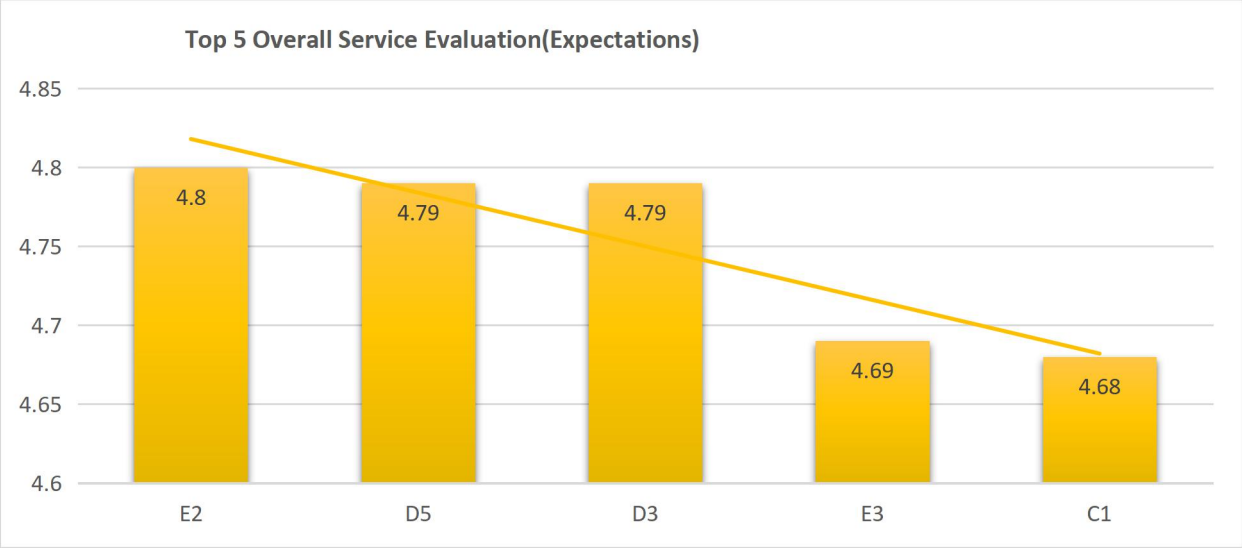


Figure 7.Top 5 Overall Service Evaluation(Expectations)

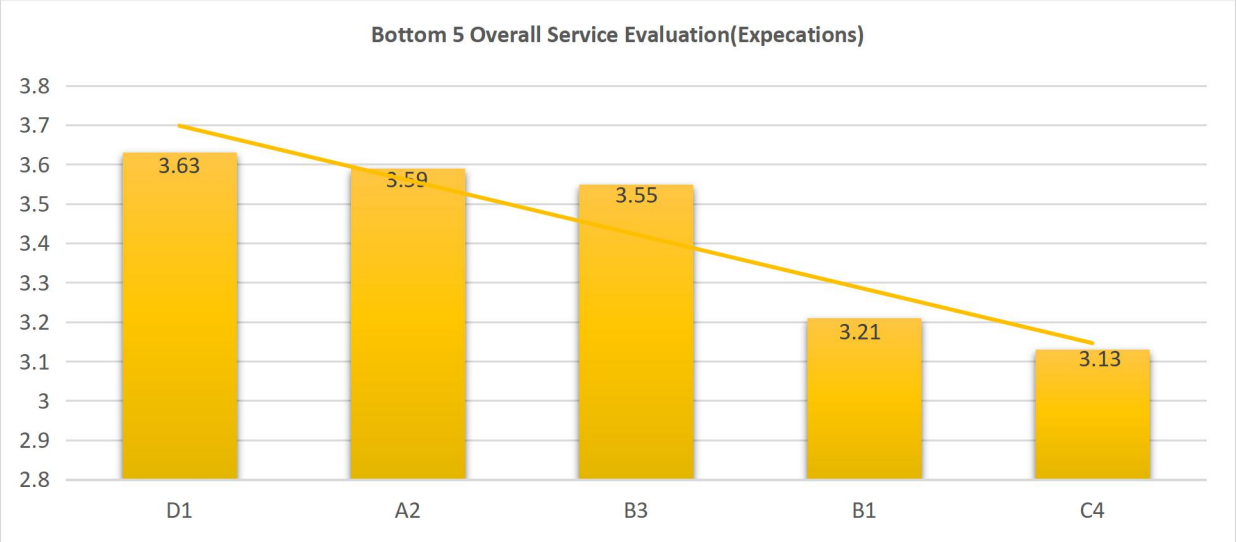


Figure 8.Bottom 5 Overall Service Evaluation (Expectations)

4.2.2 Mean value of perceived quality of ground logistics services at WQ airport

In this section I will calculate the average value of customer value of perceived for each issue through the actual data obtained from the questionnaire.The analysis is shown in Table 9.

Table 9. Average value of perceived quality of ground logistics services at WQ airport

NO.	Questionnaire questions	Min.	Max.	Average	Sorting
A1	Adequate number of airport cargo terminals	1	5	1.91	20
A2	Airport loading and unloading equipment level	1	5	3.86	4

A3	Airports have efficient security screening equipment	1	5	3.87	3
B1	Quality of assembly of outbound cargo	1	5	2.17	16
B2	The airport is able to record the relevant services correctly	1	5	2.19	13
B3	The airport completes what it promises to customers in a timely manner	1	5	2.30	9
B4	The airport gives priority to the customer's interests	1	5	2.26	10
C1	Speed of updating airport information	1	5	2.20	12
C2	Speed of sorting cargo at the airport	1	5	2.17	15
C3	Airport gives feedback on customer complaints	1	5	2.16	17
C4	Efficiency of airport outbound assembly	1	5	2.18	14
D1	Airport can compensate customers' loss in time	1	5	3.90	1
D2	Staff can provide better service	1	5	3.76	6
D3	High quality of airport logistics staff	1	5	3.80	5
D4	The adequacy of the airport's number of relevant professionals	1	5	3.75	7
D5	Whether the airport can provide personalized services to customers	1	5	3.89	2
E1	Airport staff can provide good care to customers	1	5	2.13	18
E2	Employees are polite	1	5	2.09	19
E3	The airport can train its staff to serve customers better	1	5	2.35	8
E4	The airport's logistics service rules and regulations are sound and reasonable	1	5	2.24	11

After statistical analysis, the respondents' actual perceived quality of WQ ground logistics services are above 2. The total calculated perceived quality score is 2.76, the maximum value is 3.9, and the minimum value is 1.91, which indicates that there is a certain gap between the perceived quality of services provided by WQ airport and the expected quality, and there are certain problems in the process of logistics services, but in general, the perceived quality of logistics services of WQ airport is good and at a medium level.

The top five rankings of service perception quality are: D1,D5,A3,A2,D3. The bottom five in order are: B1,C3,E1,E2,A1.

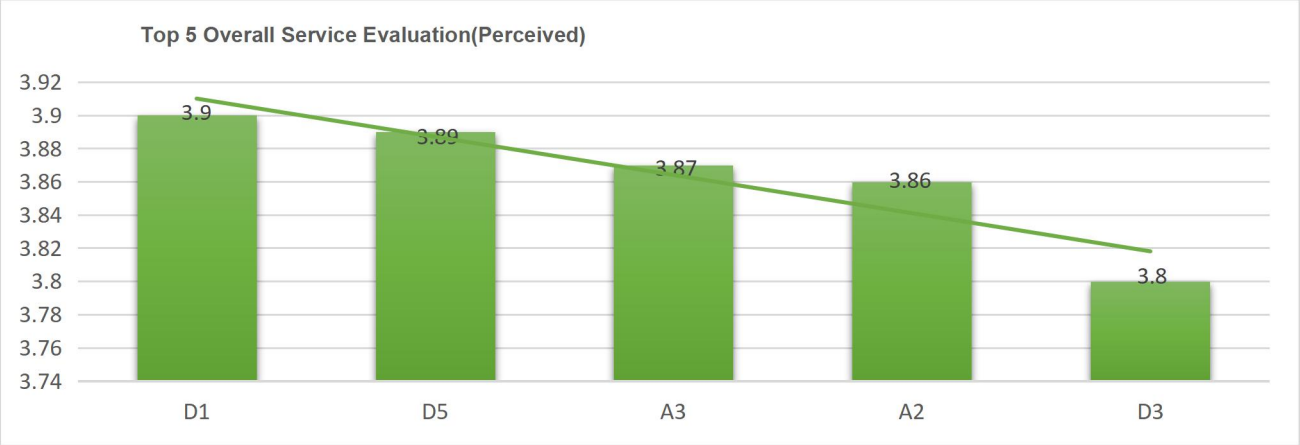


Figure 9. Top 5 Overall Service Evaluation(Perceived)

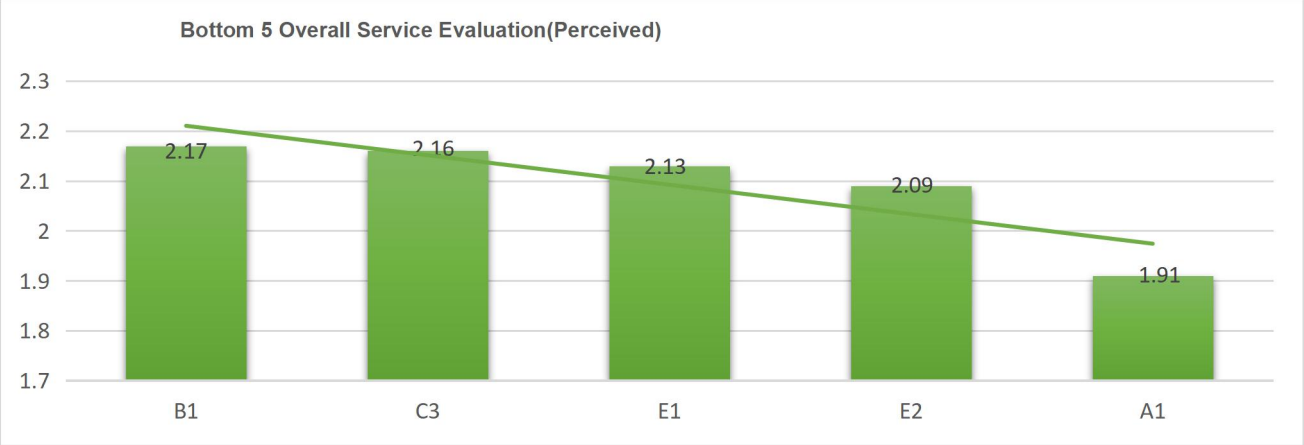


Figure 10. Bottom 5 Overall Service Evaluation(Perceived)

4.3 Expectation-Perception results

By collating the questionnaire data, the perceived mean value and expected mean value of each index of ground logistics at WQ airport will be obtained, and the difference between them and the difference will be obtained according to Equation 1. Meanwhile, the weights of each indicator previously obtained are listed in Table 10.

Table 10. WQ airport ground logistics service stations to see the perception-expectation gap

Dimension	Question No.	Questionnaire questions	Perception-expectation gap	Sorting	Weight

Tangibility	**A1**	Adequate number of airport cargo terminals	-2.355	18	0.210
	A2	Airport loading and unloading equipment level	0.267	2	0.505
	A3	Airports have efficient security screening equipment	-0.722	6	0.285
Reliability	**B1**	Quality of assembly of outbound cargo	-1.04	9	0.211
	B2	The airport is able to record the relevant services correctly	-2.038	13	0.225
	B3	The airport completes what it promises to customers in a timely manner	-1.263	10	0.297
	B4	The airport gives priority to the customer's interests	-2.035	12	0.267
Responsiveness	**C1**	Speed of updating airport information	-2.479	19	0.216
	C2	Speed of sorting cargo at the airport	-2.039	14	0.282
	C3	Airport gives feedback on customer complaints	-2.354	17	0.318
	C4	Efficiency of airport outbound assembly	-0.461	4	0.184
Assurance	**D1**	Airport can compensate customers' loss in time	0.272	1	0.442
	D2	Staff can provide better service	-0.431	3	0.143
	D3	High quality of airport logistics staff	-0.986	8	0.041
	D4	The adequacy of the airport's number of relevant professionals	-0.625	5	0.089
	D5	Whether the airport can provide personalized services to customers	-0.899	7	0.285
Empathy	**E1**	Airport staff can provide good care to customers	-2.196	15	0.208
	E2	Employees are polite	-2.704	20	0.224
	E3	The airport can train its staff to serve customers better	-2.342	16	0.257
	E4	The airport's logistics service rules and regulations are sound and reasonable	-1.772	11	0.311

According to Table 10, it can be seen that except for the level of airport loading and unloading equipment and the airport having security check equipment of universities which are positive, other indicators show that there is a negative gap between perception and expectation, which indicates that the ground logistics of WQ airport does not fully meet the expectation, that is, the level of ground logistics service quality provided by WQ airport is lower than the expectation, and

there is a gap between the quality of logistics service of WQ airport and the expectation of customers. If SQ is used to represent the service quality score of each dimension of tangibility A, reliability B, responsiveness C, assurance D, and red E, using the weights obtained from the above calculation, we can obtain:

$$SQ(A) = 0.21 \times (-2.355) + 0.505 \times 0.267 + 0.286 \times (-0.722) = -0.57 \quad (12)$$

$$SQ(B) = 0.211 \times (-1.04) + 0.225 \times (-2.038) + 0.297 \times (-1.263) + 0.267 \times (-2.035) = -1.60 \quad (13)$$

$$SQ\ (C) = 0.216 \times (-2.479) + 0.282 \times (-2.039) + 0.318 \times (-2.354) + 0.184 \times (-0.461) = -1.94 \quad (14)$$

$$SQ(D) = 0.442 \times 0.272 + 0.143 \times (-0.431) + 0.041 \times (-0.986) + 0.089 \times (-0.625) + 0.285 \times (-0.833) = -0.28 \quad (15)$$

$$SQ\ (E) = 0.208 \times (-0.196) + 0.224 \times (-2.704) + 0.257 \times (-2.342) + 0.311 \times (-1.772) = -1.80 \quad (16)$$

The dimensions from highest to lowest were assurance (-0.275), tangibility (-0.57), reliability (-1.60), responsiveness (-1.94), and empathy (-1.80). After weighting the overall service evaluation can be obtained as shown in Table 11.

Table 11. Evaluation of service quality of ground logistics at WQ airport

Dimension	Dimension score	Dimension weighting (see Table 9 and Figure 1)	Weighted score	Evaluation result
Tangibility	-0.57	0.172	-0.10	
Reliability	-1.60	0.205	-0.33	
Responsiveness	-1.94	0.268	-0.52	-1.29
Assurance	-0.28	0.192	-0.05	
Empathy	-1.8	0.163	-0.29	

Multiplying Dimension score and Dimension weighting yields Weighted score,then the average of all Weighted scores is calculated to obtain Evaluation result. After the weighted calculation, the total score of ground logistics service quality provided by WQ airport is -1.29, i.e. SQ is less than 0 and Pi<Ei. i.e. the logistics service quality provided by WQ airport does not meet the psychological expectation.

4.4 Key results

In summary, questionnaire survey and empirical analysis are used. The service quality evaluation of ground logistics at WQ airport is studied and the following results are obtained.

1. Based on the previous research on service quality, this thesis takes SERVQUAL model as the theoretical basis and adjusts the dimensions of SERVQUAL model. Through literature research, the evaluation indexes of service quality are refined, and the evaluation system of WQ airport ground service quality is constructed, which consists of five dimensions of tangibility, responsiveness, economy, reliability and empathy, including 20 indexes.

2. The reliability and validity of the questionnaire scale were tested through empirical analysis to verify the validity and reliability of the evaluation system, and the service quality evaluation system of WQ airport was determined. The regression method was used to determine the dimensions and indicators.

3. According to the construction of WQ airport ground logistics service quality evaluation system, a questionnaire survey was conducted on the staff of WQ airport, and the scores of each dimension and index were obtained by analyzing the questionnaire data. From the dimensional level, the service quality scores of the airport are ranked as: Assurance > Tangibility > Empathy > Reliability > Responsiveness. In this regard, the service quality scores of all dimensions are negative, the customer perceived service is less than the desired service, and the respondents are not satisfied, so as to propose targeted countermeasures for service quality improvement.

5 Recommendations and Discussion

5.1 Recommendations

5.1.1 Suggestions for Tangibility

From the above results, the tangibles ranked 2nd, indicating that the tangibles are relatively well evaluated in the other five dimensions. Therefore, we can start from three issues in tangibility. A2 and A3 ranked 2nd and 6th and ranked good, only A1 ranked 18th, so WQ airport can improve the infrastructure of ground logistics service and improve the information level of ground logistics activities. With the increasing specialization of air cargo terminals, the requirements for ground logistics service equipment are also increasing, such as automated three-dimensional scaffolding, computerized monitoring systems, various special vehicles needed, storage equipment, and load carriers, A1 finally scored -2.355, indicating the need to build more cargo terminals. In order to effectively ease cargo operations and simplify the operation and recruitment process, measures such as unified logistics service standards, increased warehousing capacity, use of effective safety equipment, increased temporary storage space for receiving cargo, replacement of modern ground logistics equipment, and rational planning of vehicle routes should be developed.

5.1.2 Recommendations for Reliability

From the results above, the reliability ranking is 3rd and it is medium. From the results, the fast and efficient operation of air cargo depends on a high level of information visibility throughout the logistics chain, as many operational processes, such as receiving and delivery of cargo, security checks, weighing and pricing, are carried out at the air cargo terminal. The information platform will be fully integrated with government agencies, airlines and cargo information networks to ensure that the cargo in question can always be tracked. For B2, ranking 13, it is the lowest ranked of the four questions. Can airports record relevant services? Airports need to be open to criticism, proactive in solving problems and improving services effectively in order to enhance their competitiveness and improve brand effectiveness. By actively responding to various customer complaints and constantly reflecting on themselves, customer dissatisfaction becomes a valuable resource that, over time, can identify shortcomings in management and services, improve services as much as possible, and promote continuous innovation and management improvement. In addition, for several other issues, the overall capacity of the airport cargo hub is improved by improving the layout of the airport's cargo facilities and various supporting infrastructure, and increasing the overall operational efficiency of the airport. Increase

investment in infrastructure such as cargo terminals, yards, warehouses and joint port inspections. Effectively improve the cargo integrity needs of cargo service customers.

5.1.3 Recommendations for Responsiveness

WQ airport has a low logistics service response score, ranking 4th, and the results show that the airport is not able to provide timely and convenient services to its customers and cannot respond to them in a timely manner. Airports can use technology and other technical means to help airports better monitor the flow of goods and respond quickly to fluctuations in logistics in real time. At the same time, airport management software, automated collaboration platforms and other tools to optimize and coordinate the warehouse management and distribution process, thus improving the efficiency of order distribution, tracking and other aspects, and reducing the error rate. Manpower level: Airports need to develop employees' acumen, communication skills and sensitivity to strengthen collaboration and drive team speed and efficiency. At the same time, airports can further enrich the skill sets of their employees, such as providing foreign language training, management training, and operational training, in order to strengthen their skills and overall quality.

5.1.4 Suggestions for Assurance and Empathy

The lowest ranking for empathy indicates that the airport should spend a lot of time on this. WQ airport can learn from the airports in the main city. It should strengthen the professional training of relevant personnel according to its own requirements, improve the professionalism and level of services according to the relevant management standards, cooperate with relevant universities and research institutions, establish a training base for aviation logistics personnel, and the professional knowledge and business ability of workers should be checked regularly. Improve the activity level of airport talents. The airport should learn from the ground logistics service of the main city airport, study the valuable experience of other examination sites, and actively study its own logistics business by combining with its own situation. In terms of service, it should adopt a "people-oriented" service approach and practice the concept of "true service" to make Zhengzhou Xinzheng International Airport a "humanistic airport". Efforts should also be made to improve the operational quality of the airport, optimize the entire process and service environment, and provide a complete service chain for customers.

5.2 Discussion

WQ airport's ground logistics services are far from rational, although China's air logistics, although developing rapidly, but on the whole, the scale is small, low freight capacity. The scope of operation is narrow, logistics management and technical level is low, and the service level

needs to be improved. Aviation advantage is not enough. Can not meet the requirements of rapid development.

In the market economy dominated by information technology and networking, fast and efficient ground logistics is a powerful means to win the competition. This is often said to be the problem of accessibility and accessibility. Not only can the rapid dispersion of goods be realized, but likewise, the rapid gathering of goods can be realized. The goods are delivered to customers in the fastest speed.

5.2.1 Own Learning

The implementation of this questionnaire was a great learning experience for the authors. The authors believe that they gained a lot of knowledge that they could not they found during their undergraduate studies. Although a lot of knowledge was gained during the bachelor's degree studies, this survey provided a good understanding of airport employee experience, human resource management and leadership.

At present, the ground logistics of WQ airport is in the improvement stage, and as the government pays more attention to the construction of the airport and the airport itself, there will be more studies on the service quality of the airport in the future.

5.2.2 Shortcomings and future prospects

Due to various constraints, the number of questionnaires in this study is small, especially the questionnaires distributed to airports, not many volunteers participated, making the sample data not rich enough.There is less literature available in the existing research about the service quality evaluation of ground logistics at WQ airport, and the service quality evaluation system constructed by literature research, customer review data mining and airport data analysis in this thesis cannot cover all the contents of service quality and has certain limitations.

The following aspects will be taken into account in the follow-up study.

1. Expand the scope of data collection to ensure the diversity of the sample. If more respondents can be used to collect questionnaires in the questionnaire survey, more sample data may be obtained.

2. This thesis only did a basic descriptive statistical analysis of the respondents, without controlling for factors such as the customer population, and could not measure the differences in the evaluation of service quality by different groups of people or the differences in the perceived

service quality evaluation by unintelligible groups of people. Therefore, in future research, control variables can be added to the model to make the research more refined.

3. With the continuous development of the society, the service of the airport will also be improved gradually. The indicators involved in the service quality evaluation system constructed in this study are only the current concerns, and continuous improvement is needed in the future to help airports continuously improve their service quality.

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Appendices

Appendix 1. Service Quality Questionnaire

Service Quality Questionnaire

Dear Sir/Madam,

Thank you very much for taking time out of your busy schedule to fill out this questionnaire! The purpose of this survey is to find out your evaluation of the quality of ground logistics services at WQ airport. The data of this survey will be used in the writing of the undergraduate thesis, anonymously, and never for commercial use, so please feel free to fill it out, and thank you again for your participation and support!

In the table below, the left part is your expected service situation, and the right part is your actual perceived service situation. Please rate each of the following on a five-point scale, with 1 being the lowest and 5 being the highest (1 to 5 being very poor, poor, general, good, and excellent). Please tick the corresponding box according to the actual situation.

Expected service situation(E)					**Questions**	**Perceived service situation(P)**				
1	2	3	4	5	Availability of a sufficient number of airport cargo terminals	1	2	3	4	5
					What is the level of airport cargo handling equipment					
					How efficient security screening equipment is available at the airport					
					What is the quality of assembly of outbound cargo?					
					How well does the airport document its services?					
					How well does the airport meet its commitments to					

					customers in a timely manner?					
					Does the airport prioritize the interests of its customers?					
					How quickly does the airport update airport information?					
					How quickly does the airport sort cargo?					
					How well does the airport respond to customer complaints?					
					How efficient is the airport in outbound assembly?					
					How well does the airport compensate customers for lost time?					
					Can the staff provide better service?					
					Is the quality of the airport's logistics staff high?					
					Does the airport have a sufficient number of relevant professionals?					
					Can the airport provide personalized services to customers?					
					Can the airport staff provide good service to customers?					
					Are the staff polite?					
					Can the airport train its staff to serve its customers better?					
					Are the airport's logistic service rules and regulations sound and reasonable?					