Evaluation of passenger service within the area of Beijing west railway station

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Abstract

Purpose – This study aims to analyze passenger service quality in Beijing West Railway Station from the perspective of passengers, to better understand the current service quality and obtain the areas of weakness for improvement.

Design/methodology/approach – The research investigates the passenger experience of service in Beijing West Railway Station by using a questionnaire survey. The service quality (SERVQUAL) evaluation method is used to analyze the survey data, and it divides the passenger service into 5 attributes with 20 indicators. This research uses the Likert five-level scale method to process data and calculates the SERVQUAL value and weight difference of each attribute to evaluate the passenger service. Therefore, the deficiencies have been pointed out, so the station manager can improve the passenger service accordingly.

Findings – It is indicated that among the five studied attributes, Beijing West Railway Station has the smallest service quality value in terms of timeliness, which means this part needs the largest improvement. To the five attributes, each lacks in station security check, ticketing efficiency, station identification accuracy, emergency processing of train delays and the restroom environment, respectively.

Originality/value – The research can provide specific suggestions for the optimization of the passenger service of Beijing West Railway Station, and provide reference information for the formulation of policies.

Keywords Railway passenger service evaluation, Beijing west railway station, SERVQUAL evaluation method, Likert five-level scale method

Paper type Research paper

1. Introduction

With the rapid development of society and the national economy in China, the urban scale has gradually expanded and the transportation demands of residents have increased accordingly. Because of its advantages of high speed and accuracy, railway passenger transportation once steadily ranked among the main passenger transportation method in China and shouldered the primary task of medium and long distance passenger transportation. Nowadays, with the increasing maturity of various transportation methods, the facilities and equipment of different transportation methods are gradually improved. Passenger demand for transportation service is no longer limited to simple spatial displacement but pays more attention to the service they could receive in the transport

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process. As a result, the competition in the passenger transport market has gradually shifted to the competition in passenger service quality.

As the primary object to intuitively experience railway passenger transport services, passengers are the ones who should get the greatest attention from railway passenger stations. Therefore, it is of great practical significance to evaluate the pros and cons of passenger service and improve the service quality from the perspective of passengers. As one of the three major stations of the passenger transport hub in Beijing, Beijing West Railway Station is responsible for the arrival, departure and transfer tasks of general-speed and high-speed trains. And under the pressure of the increasing passenger volume, Beijing West Railway Station has exposed many problems in its operation and management. High-quality passenger service and efficient passenger flow organization can help improve the operation level of the station. Therefore, it is of great significance to analyze the current work organization and service level of Beijing West Railway Station from the perspective of passengers and put forward corresponding optimization suggestions, so as to improve the work efficiency and organization level of Beijing West Railway Station.

Parasuraman *et al.* (1985) propose the service quality gap model and the service quality method. The establishment of the service quality (SERVQUAL) evaluation method marks the basic formation of the framework of the service quality evaluation theoretical system, which brings the service quality research to a new level. The method divides the relevant evaluation indicators by setting five dimensions and uses the gap between the actual perceived service and the expected service to determine the evaluation results. Zhang and Yao (2005) analyze the psychological factors of railway passengers and establish a comprehensive service evaluation index system on railway passenger transport upon psychological needs. The system highlights the important roles of emotional responding index, riding interest and intention index, as well as objective comprehensive evaluation index of passenger psychology in railway passenger service comprehensive evaluation.

Existing research on the management methods of railway passenger service quality mainly implements the passenger-oriented service concept. Regarding meeting passenger demands as the primary goal, the research implements passenger-centered service quality evaluation and uses the SERVQUAL theory to evaluate service quality. Nathanail (2008) puts forward the idea of constructing a railway service quality supervision system. Through the participation and evaluation of passengers, the quality of railway passenger services can be effectively supervised. The implementation of this idea would effectively improve the decision-making process of railway transport enterprises and the passenger service. Chen and Lin (2010) point out that passenger service quality hinges on the comparison between passenger perception of service expectation and the actual contrast, so the quality of service areas can be considered subjective. Therefore, the quality evaluation of railway passenger service depends on the experience of passengers. And the railway passenger transport companies may guide passenger expectation to satisfaction by the evaluation results.

Awasthi *et al.* (2011) present a hybrid method of SERVQUAL and fuzzy TOPSIS which can be used to evaluate service quality of urban transportation systems, and an application of the proposed approach for evaluation of service quality of metro in Montreal is provided. Chou *et al.* (2011) consider that human judgments are often vague and it is not easy for passengers to express the weights of evaluation criteria and the satisfaction of airline service quality using an exact numerical value, it is an appropriate method to use a fuzzy set theory for dealing with uncertainty. And the effectiveness of the fuzzy weighted SERVQUAL model is demonstrated by a case study of Taiwanese airlines. Cao and Chen (2012) use the structural equation model to analyze the relationship between the service quality of high-speed railway passenger transport and passenger loyalty. The results show

that the passenger service quality is the factor which has the greatest impact on the image of the company. Passenger service quality also has a certain impact on passenger satisfaction and can radiate to the loyalty of passengers.

Gosh *et al.* (2017) use regression analysis to determine a model of passenger satisfaction, and a service quality performance matrix is constructed to demarcate between amenities that need to be improved and those that may be maintained. The validated model can be useful for policymakers in defining policies and strategies for improving platform-based amenities. Miranda *et al.* (2018) investigate whether different combinations of service quality dimensions affect railway customer satisfaction. An extension of SERVQUAL is used to analyze the responses from an online survey of 352 railway customers. And the results show that three different combinations of the service quality dimensions lead to overall customer satisfaction. Luke and Heynes (2020) use the SERVQUAL evaluation method to promote the public transportation service, the research is of value to transport service providers in understanding the gaps in and requirements of their service provision. And it also highlights the dissatisfaction in the current levels of public transport service to the policymakers, as well as provides some indication of areas in which future interventions can be directed. Chen and Chang (2021) study the passenger service by the passenger evacuation ability in the railway station and put forward the investigation and analysis in station field, including service facilities utility and evacuation capacity from the perspective of the station.

This research makes effort to improve the service quality of Beijing West Railway Station and better serve passengers, thereby increasing the competitiveness of Beijing West Railway Passenger Transport in the transportation market. The rest of this paper is organized as follows. Section 2 introduces the survey design and data source. The evaluation method and the analysis of the results are presented in Section 3. Section 4 concludes the research.

2. Data survey and statistics

An online survey was conducted to understand the service satisfaction and importance from a passenger perspective. The survey is divided into three parts, namely, the introduction, basic passenger information and the passenger service survey of Beijing West Railway Station. The introduction part clarified the purpose of the survey and extended greetings and thanks to the participants. The second part collects the gender, age, occupation, educational level and monthly income of each passenger. The third section is the main part of the survey, which is designed on the basis of SERVQUAL evaluation method. It requires passengers to evaluate the satisfaction and importance of the 20 service indicators of Beijing West Railway Station according to their own personal experience. There are five options for each indicator, representing different levels of feelings, which can be chosen by passengers according to their subjective feelings. The 20 indicators are arranged by the passenger boarding process so that passengers can have an overall perception of the passenger service and provide more logical scores for each service. A total of 203 valid responses are obtained by the survey. Table 1 presents the descriptive statistics of the survey participants.

To better fit the actual situation, some indicators have been appropriately adjusted from the classical SERVQUAL evaluation method. The questionnaire chooses safety, reliability, timeliness, responsiveness and comfort as the main survey attributes, and uses the Likert scale method to process the data. In the satisfaction evaluation, the choices unsatisfied, relatively unsatisfied, average, relatively satisfied and satisfied correspond to scores of 1, 2, 3, 4 and 5 points, respectively. In the importance evaluation, the choices not important, relatively unimportant, average, relatively important and important correspond to scores of 1, 2, 3, 4 and 5 points, respectively. The scores of each attribute can be calculated through the

Variable	Item	No.	(%)
Gender	Male	84	41.379
	Female	119	58.621
Age (Unit: years old)	Age from 0 to 18	12	5.911
	Age from 19 to 25	121	59.606
	Age from 26 to 35	30	14.778
	Age from 36 to 45	19	9.360
	Age from 46 to 60	14	6.897
	Age over 60	7	3.448
Educational	Middle school or below	19	9.360
	High school	48	23.645
	Bachelor/Junior college	115	56.650
	Master or above	21	10.345
Occupation	Government employee	4	1.970
	Technicist	5	2.463
	Company employee	13	6.404
	Service staff	6	2.956
	Industrial worker	3	1.478
	Worker engaged in agriculture, forestry, animal husbandry and fishery	0	0.000
	Freelancer	12	5.911
	Student	133	65.517
	Private entrepreneur	11	5.419
	Unemployed	3	1.478
	Retiree	6	2.956
	Others	7	3.448
Monthly income (Unit: thousand Yuan RMB)	Less than or equal to 2.000	62	30.542
	Greater than 2.000 and less than or equal to 4.000	55	27.094
	Greater than 4.000 and less than or equal to 6.000	44	21.675
	Greater than 6.000 and less than or equal to 8.000	29	14.286
	Greater than 8.000	13	6.404

Table 1.
Descriptive statistics of the survey participants

results of the survey, the average values of importance and satisfaction are shown in Table 2. Our research chooses the importance score to describe the weight of each indicator and attribute, and they are shown in Table 3.

3. Evaluation method and analysis

Considering the problem scenarios and data characteristics, the method adopted in this study mainly derives the direction of service optimization from the difference between passenger expectation and their actual feeling. With the reference to the classical SERVQUAL evaluation method, our method is used to calculate the service quality (SQ) value of each attribute, which is shown in equation (1). The weight difference can be calculated through equation (2). With the decrease of the weight difference, the gap between the actual condition and passenger expectation becomes larger, which means there is greater room for improvement in this aspect of service. The SQ value of each attribute and the weight difference of each indicator can be calculated by the equations. The results of the calculations are shown in Table 4. To more intuitively observe the data characteristic of each indicator and their mutual influence, the data in Table 4 is transformed into the following radar charts shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5 and Figure 6, respectively:

$$SQ = \sum_{k=1}^{5} W_k \frac{\sum_{i=1}^{R} (\overline{P_i} - \overline{E_i})}{R} \tag{1}$$

Attribute	SERVQUAL number (SN)	Indicator	Importance average value	Satisfaction average value
A	A1	Security check	4.991	4.778
Safety	A2	Station public security	4.983	4.77
	A3	Luggage safety	4.952	4.889
B	B1	Ticketing information accessibility	4.941	4.813
Timeliness	B2	Ticketing efficiency	4.939	4.719
	B3	Transfer convenience	4.963	4.755
	B4	Entry/exit convenience	4.918	4.832
	B5	Check-in efficiency	4.926	4.806
C	C1	Train forecast accuracy	4.952	4.905
Reliability	C2	Departure punctuality	4.973	4.918
	C3	Station identification accuracy	4.928	4.864
D	D1	The station staff try their best to help the passengers	4.956	4.852
Responsiveness	D2	The station staff is able to respond to passenger inquiries timely	4.973	4.879
	D3	The station staff is able to effectively deal with passenger complaints	4.954	4.813
	D4	Emergency processing of train delays	4.989	4.842
E	E1	The overall environment clean and tidy	4.945	4.865
Comfort	E2	Mobile charging service	4.842	4.988
	E3	Restroom environment	4.922	4.712
	E4	Waiting room capacity is reasonable	4.947	4.877
	E5	The station staff are well behaved	4.989	4.891

Table 2.
Average value of each indicator

Attribute	SERVQUAL number (SN)	Indicator	Indicator weight	Attribute weight
A	A1	Security check	0.334	14.982
Safety	A2	Station public security	0.333	
	A3	Luggage safety	0.333	
B	B1	Ticketing information accessibility	0.200	24.781
Timeliness	B2	Ticketing efficiency	0.200	
	B3	Transfer convenience	0.201	
	B4	Entry/Exit convenience	0.199	
	B5	Check-in efficiency	0.200	
C	C1	Train forecast accuracy	0.333	15.239
Reliability	C2	Departure punctuality	0.335	
	C3	Station identification accuracy	0.332	
D	D1	The station staff try their best to help the passengers	0.249	20.035
Responsiveness				
	D2	The station staff is able to respond to passenger inquiries timely	0.250	
	D3	The station staff is able to effectively deal with passenger complaints	0.249	
	D4	Emergency processing of train delays	0.252	
E	E1	The overall environment clean and tidy	0.201	24.963
Comfort	E2	Mobile charging service	0.196	
	E3	Restroom environment	0.200	
	E4	Waiting room capacity is reasonable	0.201	
	E5	The station staff are well behaved	0.202	

Table 3. Summary statistics of attribute weight

Attribute	SERVQUAL number (SN)	Indicator	SQ value	Weight difference
A	A1	Security check	−2.384	−0.071
Safety	A2	Station public security		−0.069
	A3	Luggage safety		−0.020
B	B1	Ticketing information accessibility	−3.778	−0.026
Timeliness	B2	Ticketing efficiency		−0.044
	B3	Transfer convenience		−0.040
	B4	Entry/Exit convenience		−0.018
	B5	Check-in efficiency		−0.024
C	C1	Train forecast accuracy	−0.861	−0.013
Reliability	C2	Departure punctuality		−0.017
	C3	Station identification accuracy		−0.026
D	D1	The station staff try their best to help the passengers	−2.452	−0.028
Responsiveness				
	D2	The station staff is able to respond to passenger inquiries timely		−0.023
	D3	The station staff is able to effectively deal with passenger complaints		−0.034
	D4	Emergency processing of train delays		−0.038
E	E1	The overall environment clean and tidy	−1.951	−0.017
Comfort	E2	Mobile charging service		0.013
	E3	Restroom environment		−0.038
	E4	Waiting room capacity is reasonable		−0.029
	E5	The station staff are well behaved		−0.002

Table 4. SQ value of each attribute and the weight difference of each indicator

where SQ represents the quantitative indicators of overall perceived quality. W_k denotes the weight of each attribute. R is the number of questions in each attribute. $\overline{P_i}$ presents the average value of passenger satisfaction about the i-th indicator. $\overline{E_i}$ presents the average value of passenger expectation about the i-th indicator:

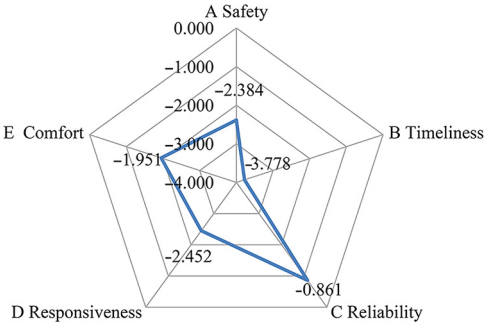

Figure 1.
SQ value of each attribute

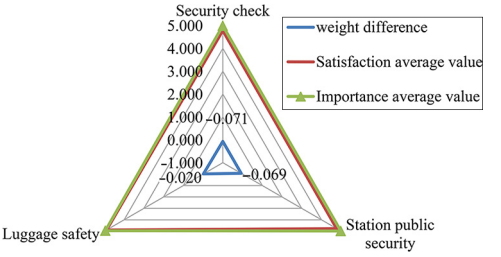

Figure 2.
Weight differences of safety indicators

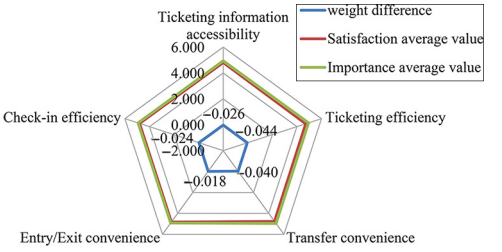

Figure 3.
Weight differences of timeliness indicators

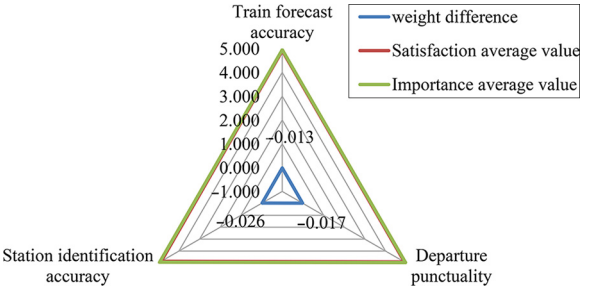

Figure 4.
Weight differences of reliability indicators

$$weight\ \ difference = \overline{P_i} - \overline{E_i} * w_i \quad (2)$$

where w_i represents the weight of each indicator in the questionnaire.

From the analysis, the expectation and actual experience of the service of Beijing West Railway Station from the perspective of passengers have been revealed. Passengers of Beijing West Railway Station have relatively high expectation for the passenger service. Although the station has reached a score above the average in all aspects, there still exists a certain distance to the expectations of passengers, which means the station can improve the service accordingly. Among the five attributes of safety, timeliness, reliability, responsiveness and comfort, Beijing West Railway Station has the smallest SQ value in terms of timeliness, which means in this attribute, the gap between passenger expectation and the actual condition is the largest, and it is the part that needs improvement most.

It is shown in Figures 3 and 4 that, in terms of safety, the weight difference of station security check is the smallest. This shows that passengers pay more attention to their personal safety, so the station should also improve management in this aspect to maintain the order of the station and protect the personal safety of passengers. In terms of timeliness, the weight difference of ticketing efficiency is the smallest, indicating that the work organization of ticketing needs to be strengthened. At the same time, it is worth noting that one of the main advantages of railway transportation is its high punctuality. Therefore, passengers have greater expectations for the timeliness of Beijing West Railway Station, and it is necessary to focus on this aspect of service.

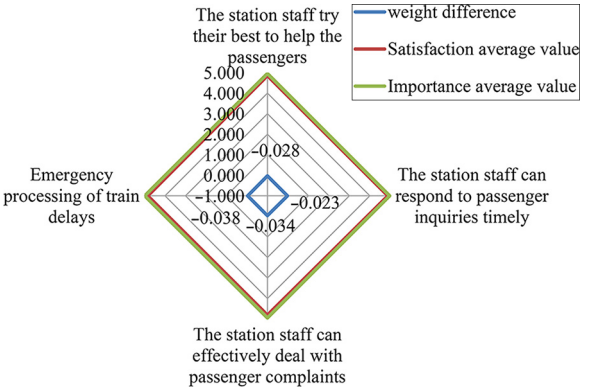

Figure 5.
Weight differences of responsiveness indicators

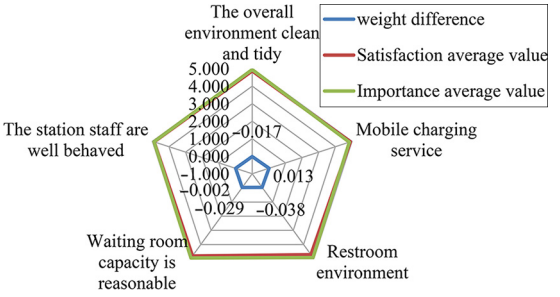

Figure 6.
Weight differences of comfort indicators

It is shown in Figures 4, 5 and 6 that, in terms of reliability, the weight difference of station identification accuracy is significantly smaller than the other two, indicating that there is still much space for improvement in this indicator. Clearly identifying the station information can not only improve passenger loyalty but also alleviate the problems such as passenger flow detours. In terms of responsiveness, the weight difference of emergency processing of train delays is the smallest. It is known as the problem that most affects the travel experience in passenger cognition. And in terms of comfort, the weight difference of the restroom environment is obviously the smallest. So, the station should enhance the cleaning work to build a comfortable environment for the passengers.

4. Conclusions

This research investigates the expectation and actual experience of the service of Beijing West Railway Station from the perspective of passengers by using a questionnaire survey. The survey is on the basis of SERVQUAL evaluation method, and chose safety, reliability, timeliness, responsiveness and comfort as the main survey attributes to obtain the importance and expectation value of each indicator. Then, the SQ value and weight difference of each aspect can be calculated. Beijing The attribute with the smallest SQ value means the gap between passenger expectation and the actual condition is the largest, and it is the part that needs improvement most. Therefore, the deficiencies of service could be found out, and the station can improve their service accordingly.

It is indicated that among the five studied attributes, Beijing West Railway Station has the smallest SQ value in terms of timeliness, which means this part needs the largest improvement. To the five attributes, each lacks in station security check, ticketing efficiency, station identification accuracy, emergency processing of train delays and the restroom environment, respectively. The disadvantage is that due to the limited number of questionnaire responses and the representativeness of the interviewees, the analysis conclusions may be one-sided.

References

Awasthi, A., Chauhan, S., Omrani, H. and Panahi, A. (2011), "A hybrid approach based on SERVQUAL and fuzzy TOPSIS for evaluating transportation service quality", *Computers and Industrial Engineering*, Vol. 61 No. 3, pp. 637-646.

Cao, C. and Chen, J. (2012), "Analysis on service quality passenger satisfaction and passenger loyalty relationship of high-speed railways", *Journal of the China Railway Society*, Vol. 34, pp. 1-6.

Chen, X. and Chang, Y. (2021), "The study of evacuation passenger service level of Shanghai-Nanjing high-speed railway stations", *Procedia – Social and Behavioral Sciences*, Vol. 96, pp. 265-269.

Chen, X. and Lin, X. (2010), "Research on relationship between rail – passenger expectation and satisfaction", *Journal of the China Railway Society*, Vol. 32, pp. 23-26.

Chou, C., Liu, L., Huang, S., Yih, J. and Han, T. (2011), "An evaluation of airline service quality using the fuzzy weighted SERVQUAL method", *Applied Soft Computing*, Vol. 11 No. 2, pp. 2117-2128.

Gosh, P., Ojha, M. and Geetika, (2017), "Determining passenger satisfaction out of platform-based amenities: a study of Kanpur Central railway station", *Transport Policy*, Vol. 60, pp. 108-118.

Luke, R. and Heynes, G. (2020), "An analysis of the quality of public transport in Johannesburg, South Africa using an adapted SERVQUAL model", *Transportation Research Procedia*, Vol. 48, pp. 3562-3576.

Miranda, S., Tavares, P. and Queiró, R. (2018), "Perceived service quality and customer satisfaction: a fuzzy set QCA approach in the railway sector", *Journal of Business Research*, Vol. 89, pp. 371-377.

Nathanail, E. (2008), "Measuring the quality of service for passengers on the Hellenic railways", *Transportation Research Part A: Policy and Practice*, Vol. 1, pp. 48-66.

Parasuraman, A., Valarie, A. and Leonard, L. (1985), "A conceptual model of service quality and its implications for future research", *Journal of Marketing*, Vol. 49 No. 4, pp. 41-50.

Zhang, X. and Yao, J. (2005), "Study on the comprehensive service evaluation model of railway passenger transport based on passenger psychological needs", *Railway Transport and Economy*, Vol. 9, pp. 79-81.

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