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The system evaluation of passenger station travelers satisfaction

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Abstract: With economic development, abundant modes of transport, the quality of people's in demand for travel gradually increases ,and therefore optimizing and improving passenger station service system seems imperative. In order to improve the quality of passenger service, we shall establish a scientific and reasonable evaluation system, through the terminal passenger satisfaction evaluation to determine whether passenger service to make visitors satisfied and propose specific measures to improve service quality for lower service satisfaction. In this paper, Hohhot, as an example, we conducted evaluation studies for passenger station service, and put forward the corresponding improvement suggestions to improve passenger satisfaction, but also proved the feasibility and practicability of the model established in terms of passenger station's travelers satisfaction evaluation. The study not only can improve the competitiveness of transport companies but also conducive to the future development of the passenger market.

Passenger satisfaction

Passenger satisfaction means "the actual process about the actual feelings passengers receiving services compared to expectations" [1].It is the traveler satisfaction quantitative description of the qualitative indicators, reflecting the level of passenger satisfaction, but also reflects the quality of service provided by the passenger business in the minds of tourists to reach results. To a certain extent, passenger satisfaction is mapped the passenger service quality and passenger service environment.

Passenger satisfaction is described quantitatively by analyzing passenger travel in the evaluation of all aspects of service indicators. The purpose of the launch of passenger satisfaction survey is to take effective measures to competition, so that enterprises in the fierce market competition has always been in a dominant position. More importantly, to provide more quality services for the majority of travelers. So , Passenger transport companies must consider the issue from a passenger point of view, to understand the travel needs of the majority of long distance travelers, optimize the passenger transport service system and continuously improve service levels in order to obtain unanimous approval of the travelers.

Since 1999 our country concerned about passenger satisfaction studies, the establishment of various evaluation model [2], most tend to qualitative research , minority use quantitative analysis. This paper combines qualitative and quantitative analysis, use fuzzy comprehensive evaluation system approach, based on the characteristics of passenger Hohhot Inner Mongolia, to improve passenger satisfaction evaluation theory for providing theoretical support system and to provide a scientific basis for improving passenger station travelers satisfaction.

Establishing travelers satisfaction evaluation indicators system of passenger station

External factors affecting travelers satisfaction has a lot, Including natural attributes travelers, social attributes, travel expenses sources, distribution of passengers, their mental capacity and ability to pay. There are a lot Internal factors affecting travelers satisfaction, the main factors are from the internal transport, It also play a very important role in transportation enterprises to ameliorate their own problems . We must integrate into external and internal factors and analysis of these factors on passenger satisfaction evaluation system.

Due to passenger satisfaction evaluation with special properties of multiple indicators and multiple level, it needs to clear construction principles of the travelers satisfaction evaluation index system[3],then analyzes the characteristics of passenger satisfaction based on the factors affecting travelers satisfaction evaluation. Passenger station service quality can be analyzed from two aspects: travelers themselves and provided services. The quality of passenger service means the satisfaction degree of the passenger travel demand, which includes train security, convenience, comfort and service attitude , etc. Providing services need high technology design and conduct quality, thus forming a good feeling to passengers.

Passenger satisfaction of passenger station involves many factors. Established index system to reflect the various factors is the prerequisite and basis for scientific analysis. According to the principles and characteristics of passenger satisfaction evaluation index, we selected evaluation index into primary indicator and secondary indicator[4] . This article will be safety, comfort , convenience , economy as primary indicators ; according to the survey results we divided the fifteen secondary indicators as shown in table1.

Tab.1 Passenger satisfaction evaluation system of the passenger station

Passenger satisfaction evaluation indicators system of the passenger station	Security	A.The station of public security safety
		B.Train operation safety
		C.Personal security
	Comfort	D.Water services
		E.Passenger waiting facilities
		F.The station environment
		G.Service attitude
	Convenience	H.Train information
		H.The station channel design
		J.The station broadcasting service
		K.Transfer Service
	Economy	L.The price of the goods in station
		M.Storage costs
		N.Shipping costs
		O.Fee of extracting baggage

Using fuzzy comprehensive evaluation method for evaluating passenger satisfaction of Hohhot passenger station

Data acquisition and processing. We randomly conducted a questionnaire survey to 1200 passengers of Hohhot passenger station, scoring on the all satisfaction indicators out of 100 points. And then we sort through the results of the survey and calculate the mean value of each index, passenger satisfaction survey results are obtained. Since percentile figures cumber some, which is not convenient to calculate, so we carrie on the discrete processing.

Established rules for the evaluation grade standards: 90-100: very satisfied with 5 points; 80-89: satisfied with4 points; 70-79: general with 3 points; 60-69: not satisfied with two points;

0-59: very dissatisfied with one point. According to this rule , this treatment does not alter the classification of data capacity, and is easy to handle data. Passenger satisfaction survey results are processed as follows table 2:

Tab.2 Passenger satisfaction survey results Unit: hundred people

Degree of membership / Evaluation level / Indicators	Very satisfied	satisfied	General	Dissatisfied	Very dissatisfied
A	6	1	5	0	0
B	0	12	0	0	0
C	4	7	1	0	0
D	0	1	0	5	6
E	6	0	6	0	0
F	0	7	3	2	0
G	1	0	5	6	0
H	1	5	6	0	0
I	11	1	0	0	0
G	1	0	3	8	0
K	6	6	0	0	0
L	1	0	5	6	0
M	0	1	1	4	6
N	1	6	5	0	0
O	0	1	6	5	0

The determination of index weight. As a result of the bus passenger satisfaction evaluation system is a multi-factor, multi-level evaluation system, this paper use the analytic hierarchy process AHP [5] to determine the weight of each index.

Determine the judgment matrix scale. According to the table 1 evaluation class hierarchy, to establish judgment matrix, the factors of two indicators are compared, and two draws its important degree scale. Table 3 is the primary indicator judgment matrix and the important degree of the process and result of calculation and consistency check.

Tab.3 Primary index judgment matrix and the important degree of the process & results of calculation and consistency check

	Security	Comfort	Convenience	Economy	W_i	W_i^0	λ_{mi}	λ_{max}
Security	1	5	3	3	2.590	0.520	4.062	λ_{max} =1/4(4.062+4.0
Comfort	1/5	1	1/3	1/3	0.386	0.078	4.067	
Convenience	1/3	3	1	1	1	0.201	4.021	67+4.021+4.021)=4.043
Economy	1/3	3	1	1	1	0.201	4.021	
					4.976	1		
								$C.I.$=0.014<0.1

The same method derived judgment matrix and importance of secondary indicators as follows table 4:

Tab.4 Weights of each indicator

Index	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Weights	0.223	0.223	0.074	0.010	0.032	0.005	0.030	0.097	0.056	0.014	0.034	0.027	0.021	0.099	0.055

Fuzzy Comprehensive evaluated Passenger Satisfaction.

Firstly, establishing the fuzzy comprehensive evaluation model.

The factors set $U=\{u_1,u_2,\cdots,u_n\}$ are divided into several groups, such that $U=\{U_1,U_2,\cdots,U_s\}$, when $U_i\bigcap U_j=\varnothing$ （$i\neq j$）,we called $U=\{U_1,U_2,\cdots,U_s\}$ the first stage of

the factors set. Let $U_i=\{u_{i_1},u_{i_2},\cdots u_{i_{n_i}}\}\ i=1,2,\cdots s$, $n_1+n_2+\cdots+n_s=n$ is called the second-level factors set [6].

Let evaluation set [7] $V=\{v_1,v_2,\cdots,v_m\}$, we firstly evaluate n_i single factors set of the second stage of factors $U_i=\{u_{i_1},u_{i_2},\cdots u_{i_{n_i}}\}$,and the single factor evaluation's matrix is:

$$\tilde{R}_i=\begin{bmatrix} r_{11}^{(i)} & r_{12}^{(i)} & \cdots & r_{1m}^{i} \\ r_{21}^{i} & r_{22}^{i} & \cdots & r_{2m}^{i} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n_i,1}^{i} & r_{n_i,2}^{i} & \cdots & r_{n_i,m}^{i} \end{bmatrix} \tag{1}$$

Let U_i factors in the relative weights of V is $\lambda_i=(\lambda_{i_1},\lambda_{i_2},\cdots;\lambda_{i_n})$, where $\sum_{j=1}^{n_i}\lambda_{i_j}=1$, then the first-class comprehensive evaluation is $\tilde{B}_i=\lambda_i\circ\tilde{R}_i=(b_{i1},b_{i2},\cdots;b_{im})\quad(i=1,2,\cdots s)$

Comprehensive evaluation in the first stage the factors set $U=\{U_1,U_2,\cdots,U_s\}$. Let the weight of $U=\{U_1,U_2,\cdots,U_s\}$ is $\lambda=(\lambda_1,\lambda_2,\cdots,\lambda_s)$, wherein $\sum_{j=1}^{n_i}\lambda_i=1$, the total evaluation matrix:

$$\tilde{R}=\begin{bmatrix}\tilde{B}_1\\ \tilde{B}_2\\ \vdots\\ \tilde{B}_s\end{bmatrix}=\begin{bmatrix} b_{11} & b_{12} & \cdots, & b_{1m} \\ b_{21} & b_{22} & \cdots, & b_{2m} \\ \cdots & \cdots & \cdots, & \cdots \\ b_{s1} & b_{s2} & \cdots, & b_{sm} \end{bmatrix} \tag{2}$$

Then Comprehensive Evaluation results are as follows table 5:

Tab.5 The Comprehensive Evaluation results

Degree of membership / Evaluation level / Indicators and weights	Very satisfied	satisfied	General	Dissatisfied	Very dissatisfied
A(0.023)	0.5	0.083	0.417	0	0
B(0.023)	0	1	0	0	0
C(0.074)	0.333	0.584	0.083	0	0
D(0.010)	0	0.083	0	0.417	0.5
E(0.032)	0.5	0	0.5	0	0
F(0.005)	0	0.584	0.25	0.166	0
G(0.030)	0.083	0	0.417	0.5	0
H(0.097)	0.083	0.417	0.5	0	0
I(0.056)	0.917	0.083	0	0	0
J(0.014)	0.083	0	0.25	0.667	0
K(0.034)	0.5	0.5	0	0	0
L(0.027)	0.083	0	0.417	0.5	0
M(0.021)	0	0.083	0.083	0.334	0.5
N(0.099)	0.083	0.5	0.417	0	0
O(0.055)	0	0.083	0.5	0.417	0
Comprehensive degree of membership	0.243	0.365	0.263	0.073	0.016

According to the maximum membership degree principle [7], we can see that Hohhot bus passengers overall satisfaction belong to the " satisfied " level. For each index satisfaction degree in the order: Passengers are very satisfied with "The station of public security safety", "The station channel design";they are satisfied with "Train operation safety", "Personal security", "The station environment" and "Shipping costs" ;They think "Train information" and "Fee of extracting baggage

" are general; To "Station broadcasting services", "Service attitude", "The price of the goods in station", passengers are not satisfied; And they are very dissatisfied with "Water services" and "The catering services" .Therefore, the passenger station in Hohhot should make corresponding improvement measures according to above analysis results, to improve its service level.

Summary

In this paper, Hohhot passenger station as an example, we evaluated its services, Accordingly proposed to improve passenger satisfaction suggestions, Summed up the Hohhot passenger station should be focused on the following aspects to improve:(1)Improve the station's own infrastructure construction, improve the waiting environment; (2)Add boiled water supply level; Organize regular staff training, strengthen the quality of training;(3) Improve the outer traffic station, strengthen the deep, station square bus station of evacuation;(4)Improve their ability to divert visitors, effectively avoid crowded with people. This study not only proved that the system evaluation studies in passenger satisfaction aspects of the feasibility and practicality, but also improved the competitiveness of enterprises in favor of passenger transport future development of the passenger market.

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