Journal of Civil Engineering and Materials Application
Journal home page: http://journals.rpp.co.ir/jcema

Received: 14 June 2018 • Accepted: 25 September 2018

Research

doi: 10.xxxxx/J.JCEMA.12020301

PLS Modeling in Order to Satisfaction Criteria Selection of Bus System (Case Study: Bus System of Zanjan City)

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ABSTRACT

Quality of service is defined as a comparison between customer expectations and service comprehension. Assessment and improvement of bus service quality is so important in order to increase the car ownership rate. In particular, research on the characteristics of service quality is important because of the high impact on customer satisfaction. Previous studies indicate that citizens have six indicators of travel time, convenience, accessibility, price, comfort, information, and safety are more important of other indicators. In this study, modeling of service quality indicators in the bus system of Zanjan city has been investigated. In this way, by these indicators, the most important factors of customer satisfaction were identified. The research method was empirical and the travelers were surveyed and the data extracted from the questionnaires were analyzed using the Smart PLS software. It is worth noting that at the end, a model was developed to determine customer satisfaction with the mentioned variables (quality indicators), which had the highest weights, respectively, safety, relaxation, travel time and convenience. In addition, the satisfaction of this system was 59%.

Key words: Structural models, Satisfaction indicators, Urban bus system, PLS.

Journal of Civil Engineering and Materials Application is published by *Raika Pajuhesh Pars*; Journal p-ISSN xxxx-xxxx; Journal e-ISSN 2588-2880.

1. INTRODUCTION

Due to the limited capacity of the road network, excessive vehicle congestion has resulted in many problems such as waste of time, increased fuel and energy consumption, environmental pollution, noise and etc. (1). Hence, one of the important solutions to solve these problems is to reduce the use of private vehicles and increase the share of public transportation in the movement of passengers, along with the promotion of utility in this fleet. In fact, increasing supply and reducing demand through sustainable development of the public transportation system is an effective step in improving traffic conditions (2). Compared to a variety of public transport types, the optimization of the bus network, in particular the new modes of rapid bus transit, are the main, low-cost and fastest solutions (2). The most important goals of this system are increasing the utility of the bus, increasing passenger transportation efficiency, reducing environmental pollutants and fuel consumption, and improvement in traffic situation, all of which are aimed at correcting the pattern of consumption in the field of urban management (3). The planning, design and implementation of bus routes, especially with regard to the indicators of macro policies, require specific measures. The use of high occupancy vehicle based on the principle of more passenger travel with less cars is superior to other transportation options from a variety of aspects, such as congestion, safety, air pollution, energy consumption, etc. (2). Customer satisfaction of public transportation can be measured as a general level of customer satisfaction and is defined as a percentage of customer expectations that has been met. Customer's commitment to continuous use of bus services is expressed by a set of attitudes and behaviors that can be investigated by measuring the degree of satisfaction of individuals (4). Customers use appropriate indicators, critics, and suggestions to evaluate the relevant service parameters, and ultimately define and perform actions to improve the services provided to

customers. For transport organizations, improved customer satisfaction means improved customer care, increased system utilization, and improved public image (5). Any customer may be generally dissatisfied or satisfied after receiving a service or buying and using a product, the question is: what satisfaction is and how customer satisfaction is created, in response, it should be said that satisfaction is a positive feeling that occurs in the individual after the use of the goods or the receipt of the service. The desired feeling arises from the confrontation between customer expectations and supplier performance (6). If the goods and services received by the customer are assessed at the level of expectations, they will feel satisfied, if the level of service and goods exceeds the expectations of the customer, it will lead to tastes and a lower level of service and goods Exit leads to customer dissatisfaction with expectations. The degree of satisfaction, dissatisfaction and taste of individuals is different at any time and in each case and is always related to the distance between the expectations level and the supplier's performance in terms of the quality of the goods and services (7). When the manufacturer knows what the customer wants and what his expectations of the desired product or service are, using powerful engineers can design a product or service. At this stage, it is necessary to define and design the characteristics of the goods or services desired in accordance with different dimensions of customer needs and expectations. If the definition and design of this adaptation does not develop well, we must wait for customer dissatisfaction after receiving and using goods or services (8). Töpfer states that customer satisfaction does not depend on the type of business activity of an organization or on the market position of the organization, but depends on the ability of the organization to meet the expected quality of the customer (9). Oliver believes that customer satisfaction or his dissatisfaction derives from the difference between the customer's expectations and the quality that he has received. Oliver believes that customer satisfaction or dissatisfaction arises from the difference between customer expectations and the quality that he or she has received that emphasizes the perception of product or service performance in relation to the expectations we had before the purchase. According to Oliver's definition, satisfaction is judgments about whether the characteristics of a product or service, or of a product or service itself, have provided a satisfying level of consumer-reciprocity (10). Satisfaction of service quality is usually referred to technical quality and functional quality (11). Customers often do not have much information on technical services. Therefore, functional quality is considered as the main factor in the level of customer perception of service quality (12). The quality of service is defined as the perception of customers that the service is well served by the extent to which they meet their expectations (13). Quality of service is assessed by criteria such as customer perception, customer expectations, customer satisfaction, and customer attitude (14). Ekinci stated in 2003 that the assessment of service quality would lead to customer satisfaction (15). Satisfaction is an indicator of evaluation based on emotional responses to services (16). In this study, the role of quality of service in satisfaction of customers from bus services of Zanjan municipality is investigated. Various researchers have looked at different dimensions of service quality. Gronroos (1884) considered the technical, functional, and historical qualities of the service (11), as well as Lehtinen (2008) considered interactive, physical and organizational quality (17). Hedvall and Paltschik (1988) focused on the desire and ability to serve and access physical and mental services to the desired service (18). In the basic service quality models, the ten main factors that can be understood by service providers and customers are trustworthiness, accountability, competence, access, modesty and suitability, communication, credibility, security, customer awareness and The ability to formulate the service quality framework (SERVQUAL) (19). Later in 1988, these ten factors became five factors: reliability, assurance, tangibility and accountability (PATER). Customer satisfaction analysis techniques allow significant aspects of the provided services to be recognized and customer satisfaction increases (20). Other studies have also carried out various indicators of the quality level in different services. For example, in the second chapter of the report TCRP 100, the quality of public transportation depends on understanding the performance of this system from the point of view of the passengers. Also, TCRP 88 reports five categories mentioned for measuring the level of performance from the passenger's point of view: 1- availability of the public transportation system, 2- monitoring of the system's services, 3- travel time, 4- safety and security, And 5 - the dynamics of the construction and maintenance of travelers' trips (21). Agrawal (2008) introduced employee behavior as the most important and most relevant customer satisfaction index in India's rail system (22). Hood, in a 1996 study in New York City, said that the first factor of low citizenship in the bus system is the negative view of the system (23). Graham and Ian, by examining the likely influences on the potential for increasing the passenger transport system of the bus, concluded that variables of air conditioning, the use of CCTV systems in the bus and in stations, could increase the number of passengers by 3 to 4 percent (24). Aboli and Mazzulla (2007) provide customer satisfaction indicators of the bus system, including availability of shelter and couch at bus stations, cleanliness, overcrowding, information systems, safety, employee safety, employee assistance and guidance, and conditions. Physical bus stations (5). The TCRP 100 report provided these indicators for the provision of convenient bus terminals: shelter, waiting room and its chairs, ports, stairs, escalators, information signs and displays, public address systems, and Passenger amenities (Including shelter, bench, garbage cans, lighting, telephone booths, art, and eye-catching landscaping) (21). Satisfaction of the bus system

can be affected by many factors. For this purpose, we can mention the socio-economic status of the passengers and the conditions and facilities of the system. In a study conducted in Taiwan in 2010, the relationship between the behavioral goals of travelers and the various factors affecting it indicates that the greater use of passengers by public transport is influenced by the assessment of passengers and their satisfaction. Further use can act as a facilitator in the relationship between service evaluation and behavioral purposes (25). On the other hand, a research conducted in Calgary, Canada in 2010, shows that the time shift is most important among other variables that affect the level of satisfaction of the individual (26). In 2008, Felson and Freeman examined the perceived customer satisfaction in eight cities in Stockholm, Barcelona, Copenhagen, Genoa, Helsinki, Vienna, Berlin, Manchester and Oslo by comparing public transport services in European cities, and it was found that the bus and the design of the bus station makes it easy for the customer to enjoy the experience of travel and staffing skills and provides safety in the bus and bus stops (27).

2. METHODOLOGY

In this study, the factors of customer satisfaction index from the bus system are discussed, in order to identify the most important and most effective ones. Although customer satisfaction is usually considered as an indicator of service quality, we have seen in previous studies that there is no consensus on this. Therefore, the main goal of this study is to identify the important factors in determining the quality of services and to introduce a model with these factors. In this study, because it aims at measuring attitudes or behavior of individuals, the Likert scale, one of the most reliable methods used, is used. Measuring behaviors and attitudes on a Likert scale is evaluated using multiple-choice responses that range from a low to high level (for example, I totally disagree, to totally agree). Contrary to simple "yes / no" questions, the Likert scale has the potential to reveal the points of view, and this can be useful especially for sensitive and challenging topics, as well as having a range of answers to a researcher allows a better understanding of tendencies (28). The questionnaire consists of 7 criteria and 18 sub-criteria for measuring the satisfaction of travelers with the quality of services, which is presented in Table 1. It should be noted that these factors and variables have been gathered from various sources and past studies.

Table 1. Independent variables affecting the satisfaction of passengers with service quality

Criteria	Sub Criteria	Criteria	Sub Criteria	Criteria	Sub Criteria
Travel Time (C1)	In Vehicle Time (CS1)	convenience (C2)	Light and brightness (CS7)	Relaxation (C5)	Self-paced passenger (CS13)
	Fleat Size (CS2)		The quality of the shadows (CS8)		Relaxation in terms of travel equipment (CS14)
	Access Time (CS3)	Price (C3)	Fare price (CS9)	Notifying (C6)	Bus destination notification (CS15)
	Timeline and reliability (CS4)		Access price (CS10)		bus arrival information (CS16)
convenience (C2)	Enough space to sit (CS5)	Access (C4)	Bus Ticket Price (SC11)	Safety (C7)	Chance of crash (CS17)
	Ventilation (CS6)		Competitor Mode Price (Taxi) (SC12)		Protect the lives of travelers in the crash (CS18)

3. CASE STUDY

The case area in this study is Zanjan Municipality Bus System which currently has 160 bus vehicles in the private sector, 96 bus vehicles in the organizational sector and 246 personnel. It has 24 inter-city and 9 inter-urban routes. In order to implement the plan, Zanjan Bus Station was commissioned (Sabz-e Meydan) (Figure 1).

Figure 1. Zanjan Bus Station (Sabz-e Meydan)

4. RESULT AND DISCUSSION

4.1. Reliability

The first is the reliability of data. Reliability addresses the question of whether the data collection tool is working properly and the data is properly collected, and whether the results are still valid? (One of the interpretations of this sentence is whether or not to retrieve the data again if we do again). In other words, the degree of reliability of the results of the re-implementation of the test with the measuring instrument is called sustainability. The numerical reliability coefficient is between zero and one, which is zero, indicating a lack of reliability, and one indicates the reliability of one hundred percent. Therefore, reliability is an indicator for evaluation of tests and questionnaires, including screening and diagnostic tests, and research questionnaires. For two reasons, they are important: First, reliability indicates that there is a random error in the measurement of which this error is due to factors related to the test, the factors associated with the test and the conditions for conducting it, as well as factors associated with scoring, which are such random errors and their effect on the test score is unpredictable. Accordingly, if the sample size increases or the number of questions increases, reliability goes up (29).

4.2. Validity

The second is a validity that discusses whether the data collection tool (such as the questionnaire) works correctly and measures what is to be measured correctly. Validity is usually determined by experts (formal validity) or by statistical tests (29).

4.3. Reliability and validity test

In this method, questions with factor load greater than 0.7 are confirmed. First, 50 questionnaires were distributed to confirm the questions, and the results were analyzed by the software, the results of which are in Table 2. As you can see, questions that have a factor of less than 0.07 have been rejected and marked with a gray color, these questions are removed from the final questionnaire.

Table 2. Questions and factor loadings of each of them

Factor	Question Number	Factor load	Factor	Question Number	Factor load	Factor	Question Number	Factor load
Travel Time	3	0.732	Convenient	27	0.636	Access	51	0.935
	4	0.865		28	0.887		52	0.630
	5	0.245		29	0.899		53	0.789
	6	0.964		30	0.610		54	0.177
	7	0.633		31	0.436		55	0.310
	8	0.724		32	.0.766	Relaxation	56	0.868
	9	0.904		33	0.635		57	0.753
	10	-0.266		34	0.981		58	0.797
	11	0.781		35	0.690		59	0.994
	12	0.854	Price	36	0.857		60	0.935
	13	0.974		37	0.933		61	0.726
	14	0.433		38	0.868	Notifying	62	0.778
	15	0.277		39	0.407		63	0.799
	16	0.877		40	0.771		64	0.798
	17	0.807		41	0.853		65	0.781
	18	0.381		42	0.666		66	0.868
Convenient	19	0.846		43	0.797		67	0.936
	20	0.924	Access	44	0.867		68	0.663
	21	0.877		45	0.717	Safety	69	0.864

	22	0.339		46	0.241		70	0.865
	23	0.753		47	0.637		71	0.869
	24	0.795		48	0.755		72	0.744
	25	0.836		49	0.398		73	0.765
	26	-0.223		50	0.799		74	0.950

Now remove the inappropriate questions and the rest of the questions will be included in the software. This work continues until all factor loads larger than 0.7 are obtained. In Table 3, the final questions are visible.

Table 3. Final questions after several tests by software

Factor	Question Number	Factor load	Factor	Question Number	Factor load	Factor	Question Number	Factor load
Travel Time	3	0.767	Convenient	20	0.977	Convenient	37	0.757
	4	0.724		21	0.868		38	0.799
	5	0.833		22	0.859		39	0.768
	6	0.808	Price	23	0.757		40	0.792
	7	0.768		24	0.733	Notifying	41	0.808
	8	0.974		25	0.865		42	0.781
	9	0.760		26	0.767		43	0.778
	10	0.808		27	0.775		44	0.852
	11	0.848		28	0.807		45	0.844
	12	0.833	Access	29	0.833		46	0.753
Convenient	13	0.742		30	0.947	Safety	47	0.814
	14	0.934		31	0.873		48	0.720
	15	0.761		32	0.833		49	0.949
	16	0.839		33	0.764		50	0.857
	17	0.867		34	0.766		51	0.805
	18	0.948	Convenient	35	0.777		52	0.722
	19	0.731		36	0.972			

4.4. Convergent Validity

In this part, convergent validity was used to determine that each marker (Question Questionnaire) had the highest correlation with its own criterion than other criteria. When multiple indicators are used to measure any unknown variables (7 main criteria), the researcher should not only be sure of the confidence of the individual marker, but also the convergent validity of the criteria (29). Cross-factor load was used to study this issue. For this work, the correlation of each marker with all other structures of the model was calculated, which values should be higher than the other criteria for the selected criteria of the researcher. Results (Table 4) showed that convergent validity was confirmed.

Table 4. Convergent Validity Results

Question Number	Criteria						
	C1	C2	C3	C4	C5	C6	C7
3	0.757	0.518	0.714	0.757	0.313	0.578	0.472
4	0.724	0.06	0.668	0.215	0.674	0.396	0.713
5	0.833	0.093	0.337	0.58	0.727	0.536	0.705
6	0.808	0.457	0.58	0.43	0.643	0.322	0.335
7	0.768	0.853	0.126	0.288	0.608	0.697	0.638
8	0.974	0.245	0.101	0.666	0.263	0.591	0.715
9	0.76	0.486	0.231	0.277	0.539	0.19	0.409
10	0.808	0.351	0.671	0.085	0.202	0.144	0.644
11	0.848	0.168	0.526	0.221	0.488	0.571	0.237
12	0.833	0.467	0.707	0.342	0.633	0.716	0.227
13	0.533	0.742	0.277	0.754	0.593	0.329	0.366
14	0.741	0.934	0.136	0.621	0.696	0.119	0.169
15	0.028	0.761	0.176	0.565	0.553	0.802	0.448
16	0.722	0.839	0.163	0.404	0.675	0.308	0.281
17	0.221	0.867	0.065	0.308	0.665	0.582	0.321
18	0.662	0.948	0.621	0.072	0.753	0.76	0.285
19	0.699	0.731	0.308	0.111	0.707	0.307	0.025
20	0.67	0.977	0.381	0.387	0.381	0.191	0.66
21	0.663	0.868	0.462	0.135	0.103	0.254	0.76
22	0.615	0.859	0.437	0.215	0.192	0.225	0.145
23	0.608	0.67	0.757	0.671	0.753	0.484	0.707
24	0.138	0.381	0.733	0.43	0.24	0.421	0.49
25	0.586	0.4	0.865	0.669	0.41	0.648	0.643
26	0.659	0.726	0.768	0.636	0.52	0.127	0.508
27	0.326	0.67	0.775	0.337	0.243	0.164	0.64
28	0.625	0.535	0.807	0.253	0.696	0.596	0.124
29	0.271	0.064	0.666	0.833	0.723	0.599	0.646
30	0.834	0.177	0.166	0.947	0.56	0.503	0.258
31	0.115	0.35	0.715	0.873	0.664	0.046	0.615
32	0.161	0.464	0.544	0.833	0.427	0.494	0.457
33	0.679	0.127	0.668	0.764	0.664	0.66	0.117
34	0.566	0.483	0.533	0.766	0.705	0.338	0.677
35	0.017	0.226	0.065	0.747	0.777	0.014	0.572
36	0.499	0.516	0.529	0.347	0.972	0.606	0.283
37	0.525	0.424	0.346	0.763	0.757	0.476	0.085
38	0.171	0.164	0.664	0.11	0.801	0.578	0.516
39	0.276	0.263	0.226	0.664	0.758	0.396	0.381
40	0.173	0.597	0.26	0.382	0.792	0.536	0.463
41	0.679	0.452	0.559	0.529	0.745	0.808	0.728
42	0.366	0.277	0.054	0.016	0.67	0.781	0.278
43	0.214	0.49	0.664	0.337	0.048	0.768	0.183
44	0.71	0.559	0.2	0.452	0.16	0.852	0.472
45	0.241	0.285	0.184	0.447	0.691	0.844	0.657
46	0.469	0.707	0.695	0.758	0.727	0.753	0.886
47	0.257	0.666	0.374	0.255	0.345	0.157	0.814
48	0.299	0.337	0.476	0.626	0.358	0.67	0.718
49	0.324	0.217	0.508	0.081	0.599	0.338	0.949
50	0.048	0.269	0.169	0.747	0.244	0.27	0.857
51	0.702	0.67	0.88	0.347	0.98	0.659	0.805
52	0.184	0.266	0.94	0.764	0.745	0.477	0.722

In Figure 2, the final design grid contains factors and acceptable questions.

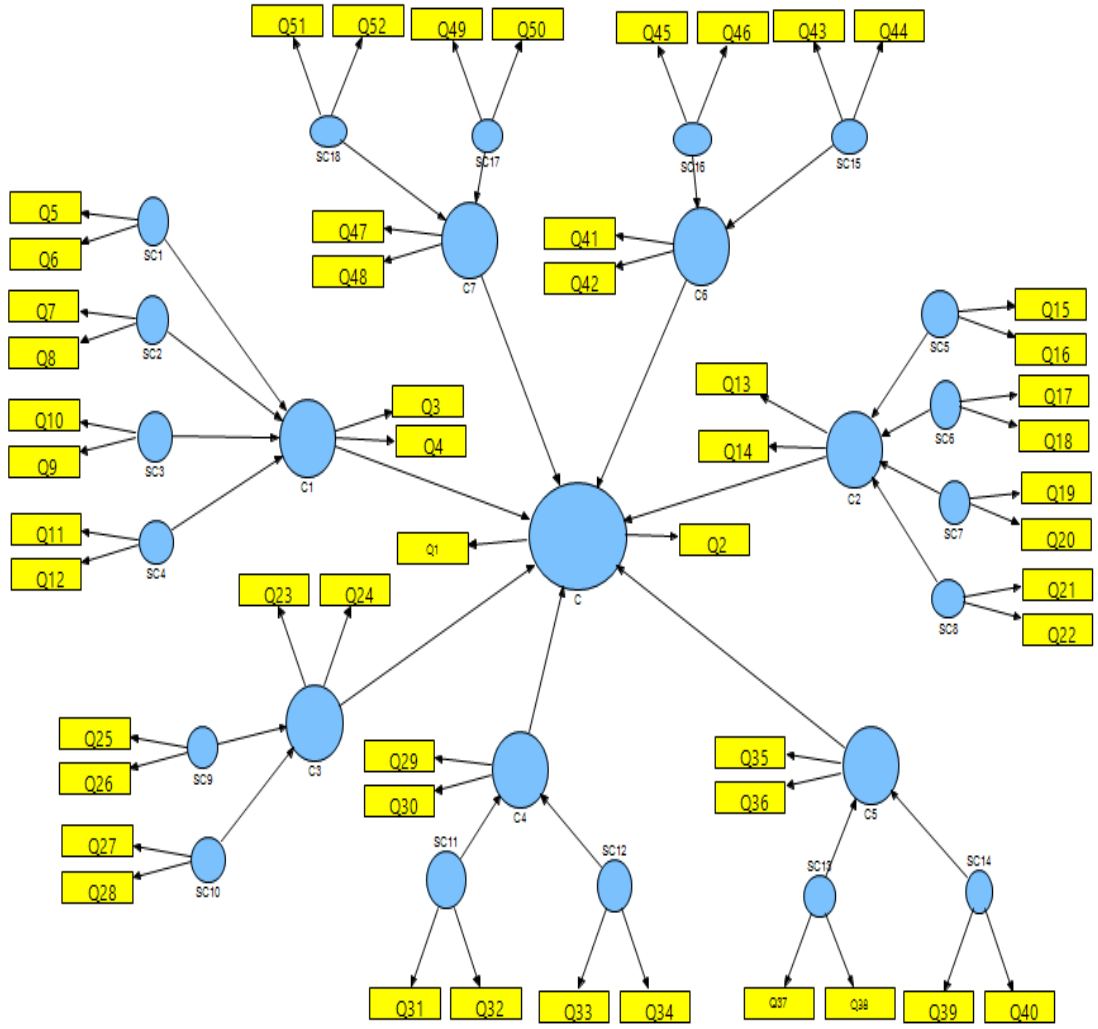

Figure 2. The final network of case study in Expert Choice

Q_i: **Question Number**

C: Customer satisfaction

4.5. Reliability test or internal consistency (alpha cronbach)

Alpha coefficient has been developed by Cronbach and it is based on the calculation of the internal consistency of the tool such as questionnaires. For example, if a research questionnaire is to be considered, a component of which consists of 5 questions, then the alpha coefficient indicates that how the distribution of the responses of individuals to these 5 questions is. For example, if the 5-option spectrum is to be questioned, the value of the first-person's response to the first question is 1. Now the answer of the first person is to part of a dimension of value one, his answer to the other part of that dimension, for example, Question 2, should not be too far away from 1. (If the value of the first question is answered by the person 1, the second question cannot be worth 4, and if the person answers the scattered questions, it is possible that the data does not have internal consistency and their validity is ruled out). According to George & Mallery study in 2016, the cronbach alpha values are as follows (30):

High values of 0.9 = excellent;
High values of 0.8 = good;
High values of 0.7 = Acceptable;
High values of 0.6 = questionable;
High values of 0.5 are weak;
As shown in Table 5, all alpha values are greater than 0.7, so their reliability is confirmed.

Table 5. Cronbach's alpha test results

Criteria	*Cronbach's alpha*	*Criteria*	*Cronbach's alpha*
C	0.810	SC6	0.872
C1	0.728	SC7	0.860
C2	0.770	SC8	0.715
C3	0.788	SC9	0.804
C4	0.713	SC10	0.771
C5	0.819	SC11	0.832
C6	0.739	SC12	0.841
C7	0.768	SC13	0.755
SC1	0.791	SC14	0.789
SC2	0.726	SC15	0.752
SC3	0.770	SC16	0.868
SC4	0.822	SC17	0.840
SC5	0.870	SC18	0.751

4.6. Composite Reliability

To verify the combination's validity of each of the factors (structures or criteria), the composite reliability criterion is used, the values should be greater than 0.7, which is in this study according to Table 6, and the compositional validity of the structures is confirmed.

Table 6. Combined Reliability Test Results

Criteria	*Combined Reliability*	*Criteria*	*Combined Reliability*
C	0.828	SC6	0.783
C1	0.87	SC7	0.791
C2	0.759	SC8	0.74
C3	0.748	SC9	0.823
C4	0.729	SC10	0.713
C5	0.842	SC11	0.756
C6	0.753	SC12	0.809
C7	0.8	SC13	0.832
SC1	0.719	SC14	0.726
SC2	0.859	SC15	0.75
SC3	0.895	SC16	0.775
SC4	0.87	SC17	0.818
SC5	0.778	SC18	0.873

4.7. Validity AVE

The AVE criterion shows the correlation of a structure with its indexes, the greater correlation, the greater the fit. The AVE criterion (mean extraction variance) is introduced for convergent validity. In the case of AVE, the critical value is 0, 5 (29). This means that the AVE value above 0.5 equals the acceptable convergence validity. According to Table 7, values above 0.5 represent the integrity or internal validity of the models.

Table 7. AVE Validity Test Results

Criteria	*Validity AVE*	*Criteria*	*Validity AVE*
C	0.628	SC6	0.571
C1	0.562	SC7	0.639
C2	0.763	SC8	0.621
C3	0.665	SC9	0.581
C4	0.705	SC10	0.543
C5	0.539	SC11	0.529
C6	0.872	SC12	0.64
C7	0.518	SC13	0.619
SC1	0.661	SC14	0.533
SC2	0.595	SC15	0.606
SC3	0.702	SC16	0.573
SC4	0.796	SC17	0.594
SC5	0.618	SC18	0.648

4.8. Diagnostic validity

According to this criterion, a hidden variable (Factor), in comparison with other hidden variables, should have more dispersion among its observations (questions). For this purpose, the average extracted variance of each hidden variable should be greater than the maximum correlation of that variable with other hidden variables of the model. In fact, this test measures the attribution validity at the level of hidden variables (29). Table 8 shows the diagnostic validity on the level of the Fornel-Larker construct. The numbers on the main diameter of this matrix are Root values of AVEs. However, if the numbers in each column

are smaller than the diameters, the diagnostic validity of the reflection model is confirmed. As can be seen in Table 8, in this study, the numbers of each column are smaller than the AVE value, which indicates the diagnostic validity of the reflective model (29). As can be seen in Table 9, the status of each criterion and sub-criteria is given in the overall model and weight of each one. For example, the C4 criterion (access) was not meaningful because its value t from the permitted value (1.96) had no effect on C (customer satisfaction) and was removed from the model. As a result, CS6 (Ventilation) and CS12 (Competitor Mode Price (Taxi)) are also excluded. According to the results of Table 9, the C7 (safety) criterion has the highest weight (0.79359) among the criteria and the lowest weight was C4 (Access). After the "safety" benchmark, the "Relaxation", "travel time", "convenient", "informational" and "price" criteria were in the next rank in terms of weight and impact on the model. It is also observed among the following criteria of each criterion that, in the "travel time" criterion, the "In Vehicle Time" criterion has the highest weight. Similarly, the criteria for "enough space to sit", "access price", "bus ticket price", " Self-paced passenger", bus arrival information, " Protect the lives of travelers in the crash " they had the highest weights in each of their criteria.

Table 8. Diagnostic Validity Test Results

	C	C1	C2	C3	C4	C5	C6	C7	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12	SC13	SC14	SC15	SC16	SC17	SC18
C	.787																									
C1	.345	.745																								
C2	.565	.564	.754																							
C3	.254	.666	.547	.723																						
C4	-.56	.365	.658	.258	.712																					
C5	-2.3	.714	.358	.652	.658	.729																				
C6	.70	-.25	.258	.547	.666	.652	.735																			
C7	.65	.123	.269	.265	.657	.625	.635	.715																		
SC1	.684	.254	.746	.214	.624	.357	.358	-.65	.739																	
SC2	.632	.365	-.36	.236	.258	.69	.368	.356	.658	.767																
SC3	.75	.287	-.24	.254	.354	-.25	.245	.369	.625	.702	.73															
SC4	.245	.654	.652	.654	.358	-.36	.369	.654	.256	.654	.548	.79														
SC5	.357	.658	.365	.356	.369	.71	.321	.587	.35	.365	.658	.75	.782													
SC6	.368	.245	.712	.258	.321	.658	.358	.596	.214	.38	.254	.658	.712	.751												
SC7	-.51	.258	.458	.269	.352	.256	.324	.586	-.25	.328	.256	-.65	.685	.705	.795											
SC8	.683	.657	.589	.705	-.21	.258	-.36	.258	.369	.54	.652	.658	.693	.658	.658	.783										
SC9	.258	.701	.652	.699	-.36	.269	.245	.245	.548	.62	.689	.326	.258	.645	.698	.457	.758									
SC10	.366	.658	.654	.587	.685	.358	-.28	.21	.521	.45	.33	.258	.698	.654	.62	.547	.68	.732								
SC11	.644	.669	.676	.658	.655	.357	.658	.27	.721	.269	.225	.269	.654	.58	.654	.254	.255	.71	.722							
SC12	.255	.365	.745	.654	.256	.314	.65	.258	.452	.368	-.56	.247	.665	.587	.587	.126	.258	.584	.658	.795						
SC13	.73	.333	.678	.357	.289	.625	-.58	.365	.70	-.65	.35	.214	.587	.598	.514	.356	.269	.685	.258	.658	.782					
SC14	-.55	-.54	.122	.358	.247	.614	.652	.689	.524	.65	.666	.547	.725	.625	.528	-.65	.654	.652	.365	-65	-.46	.725				
SC15	-.14	-.62	.225	-.55	-.26	.658	.698	.625	.563	.654	.632	.586	.715	-.25	.458	.658	.635	.698	.458	-32	.69	.026	.774			
SC16	.598	.699	.547	.658	.258	.699	.624	.614	.52	.258	.658	.698	.548	-.14	.59	.254	-.45	.358	.269	.698	.658	.258	.589	.752		
SC17	.487	.313	.699	.547	-.14	.265	.587	.617	.352	.14	.475	.625	-.65	.74	.58	.574	-.32	.254	.589	.314	.358	.698	.657	.716	.766	
SC18	.369	.547	-.68	.699	-.65	.254	.547	-.70	.214	.257	.258	.358	-.74	.58	-.54	.258	.687	.257	.654	.254	.324	.214	.541	.258	.643	.801

4.9. Fit the structural model

In Table 9, the weight values of each criterion are shown in the model. In addition, t test values and the result of the test are presented. As can be seen, criterion C4 and sub criteria SC6 and SC12 are rejected by t test.

Table 9. Direct Linear Effect of Criteria and Sub-criteria on Customer Satisfaction

Relationship	Weight	T-Statistics	Result
$C1 \rightarrow C$	0.66574	9.24264	Accept
$C2 \rightarrow C$	0.62175	6.33265	Accept
$C3 \rightarrow C$	0.13398	4.37687	Accept
$C4 \rightarrow C$	0.03165	0.93825	Reject
$C5 \rightarrow C$	0.71954	4.26654	Accept
$C6 \rightarrow C$	0.27284	2.66171	Accept
$C7 \rightarrow C$	0.79359	7.12745	Accept
$SC1 \rightarrow C1$	0.66178	8.66189	Accept
$SC2 \rightarrow C1$	0.59449	7.16198	Accept
$SC3 \rightarrow C1$	0.15282	3.66445	Accept
$SC4 \rightarrow C1$	0.36178	2.22153	Accept
$SC5 \rightarrow C2$	0.75575	9.96178	Accept
$SC6 \rightarrow C2$	0.07555	0.75826	Reject
$SC7 \rightarrow C2$	0.27287	5.63241	Accept
$SC8 \rightarrow C2$	0.48547	3.27287	Accept
$SC9 \rightarrow C3$	0.13354	2.70574	Accept
$SC10 \rightarrow C3$	0.21714	3.13156	Accept
$SC11 \rightarrow C4$	0.47287	4.27284	Accept
$SC12 \rightarrow C4$	0.03264	1.54826	Reject
$SC13 \rightarrow C5$	0.66547	8.66178	Accept
$SC14 \rightarrow C5$	0.46591	7.46579	Accept
$SC15 \rightarrow C6$	0.17298	3.66178	Accept
$SC16 \rightarrow C6$	0.37247	6.55489	Accept
$SC17 \rightarrow C7$	0.66178	9.66576	Accept

$SC18 \rightarrow C7$	0.74854	8.22154	Accept

Finally, in order to show the validity of the findings of the research model, the index of the fitting of structural equation models using partial least squares method was used. The AVIF index is calculated at 2.088 and is below the crisis level of 5, indicating that multiple consistency in the model is well controlled and the accuracy of the model estimation in the prediction of the dependent variable has a reliable reliability. Independent variables that affect the dependent variable have explained each individual part of the variance of the dependent variable. In addition, APC and ARS indices indicate that the relationships between variables are well recognized and the highest coefficient is used to test the hypotheses because its value is significant (Table 10).

Table 10. Credit Estimates of the Estimated Model

Index	*Value*	*significance level*	*Result*
ARS	0.328	0.001	A large part of the data variance is expressed in terms of existing relationships.
APC	0.252	0.001	Existing coefficients for the expression of causal relationship relationships can be repeated.

4.10. Customer Satisfaction Index

In this section, the value of the customer satisfaction index is calculated based on the proposed formula of Anderson and Fornell (Equation 1) (31).

$$R = \frac{\sum_{i=1}^{6} w_i \bar{x}_i - \sum_{i=1}^{6} w_i}{9\sum_{i=1}^{6} w_i} * 100 \qquad (1)$$

Table 11. The mean and weight of the variables for the proposed formula for Anderson and Fornell

Variable	*Mean(x_i)*	*Standard deviation*	*Weight (w_i)*
C1	6.79	1.605	0.66574
C2	7.11	1.385	0.62175
C3	5.99	1.835	0.13398
C5	7.28	2.174	0.71954
C6	8.4	1.996	0.27284
C7	6.49	1.687	0.79359

By placing the values of Table 11 in equation (1), the satisfaction index is obtained by 59%. Given that the questionnaire was distributed solely among those who used public transportation, 59% indicated a low satisfaction.

5. CONCLUSION

In this study, considering the design of the questionnaire and its confirmation, it was attempted to identify the indicators of customer satisfaction from the quality of service of the bus system of Zanjan. Also, tests were done to confirm the reliability and validity of the questionnaire and the model. Accordingly, the number of questions from the questionnaire dropped from 74 to 52, and the 52 questions were included in the final questionnaire. All reliability and validity tests of the model were approved. In addition, the validity of the model was also adjusted according to the AVIF index, which was larger than 5. In this study, the "safety", "relaxation", "travel time", "Convenient", "Notifying" and "price" indicators respectively have the highest coefficients of impact (weight) on the satisfaction model of customers in Zanjan Bus system. As was seen, the "access" criterion was eliminated from the criteria, which was not confirmed in the t test. Finally, in accordance with the proposed relationship between Anderson and Fornell, and the average of each criterion, the satisfaction index was 59%, which according to the questioner (all of the users of the bus system), this number there are a few and it is expected that the officials of the Zanjan Bus Company will solve the problems of this system and meet the needs of users.

FUNDING/SUPPORT

Not mentioned any Funding/Support by authors.

ACKNOWLEDGMENT

Not mentioned any acknowledgment by authors.

AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The author (s) declared no potential conflicts of interests with respect to the authorship and/or publication of this paper.

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