Use of Factor Analysis in Service Research- Evidence From Indian Railways

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ABSTRACT

Railways being a monopoly play a vital role in the transportation sector. Without Indian railways it is highly impossible to travel for long distance especially middle and lower class family. This study tries to find out the factors that influence the quality of service provided by Indian railways. The research design is descriptive in nature. The sampling design is stratified sampling. The area of sampling is Coimbatore division. The sample size is 150. Factor analysis is done to find out the factors which influence the service quality of Railways. After factor analysis, eight factors are identified which are Convenience, Connection, Tangibility Communication, Responsiveness, Reliability, Assurance and Empathy.

Key Words: Monopoly, Passenger, Service Quality, Transportation, Passenger Satisfaction

INTRODUCTION

Indian Railways is a major mode of transportation for the Indians. It has segmented it services to all classes of people. Special trains like Rajdhani and Shatabdi are targeted to high class people. Some trains are targeted to pilgrims like Tirupathi express. Local trains are run to target working people, students etc., In superfast trains, AC I & AC II tier are targeted to high class people, AC III and Sleeper are targeted to middle class and low class passengers. Passengers who travel for short distance and suddenly board unreserved class.

STATEMENT OF PROBLEM

The transportation sector whether it is bus or railways in Tamil Nadu is run only for service motto but not for profit. Our government is in loss in this sector because services are offered at subsidizing rate. Being monopolistic organization, it is very much necessary to study the Service Quality of railways. We know that there is a gap between the performance and expectation of the services provided by Indian railways. Hence this study tries to find out the factors contributing to Indian railways.

REVIEW OF LITERATURE

Syed Muhammad Irfan et., al (2012), found the key determinants to measure the quality of products or services and hence the organizational performance. This paper aims to investigate the passengers' perceptions about the service quality of rail transport system in Pakistan while traveling between the major cities especially from Lahore to Karachi, Multan, Peshawar and Rawalpindi. A modified SERVQUAL instrument including eight service quality constructs: empathy, assurance, tangibles, timeliness, responsiveness, information system, food and safety and security were employed to measure the passengers" perceptions about the service quality of railways. Out of 700 respondents, only 493 were selected and these respondents were frequent railway traveler on these routes. Results indicate that passengers perceive that quality of services delivered to them is not satisfactory

Sheeba and Kumuthadevi (2013), identified factors of service quality of Indian Railways in the train. The study is exploratory in nature and used factor analysis to identify the most and least important factors of customer satisfaction on service quality. The research methodology is empirical, and a survey of passengers (customers) was conducted. This study considered seven factors and 16 variables to analyze the passenger satisfaction. The study analyzed reliability Coefficient, Eigen Value and components Correlation Matrix etc. The findings of this study reveals that the most important factors determining satisfaction of passengers in train are serially comes as basic facilities, hygiene, safety & security, catering, health care service, punctuality, behavior towards passengers.

Bikramjit Singh Hundal and Vikas Kumar (2015) aims to put forth the evaluation of determinants of the passenger satisfaction on service quality of Indian Railway. The result

indicates that a larger gap has been found in Reliability and Assurance dimensions of Railway service quality and the most important factors determining satisfaction of passengers are basic facilities, safety & security, punctuality and employee behavior towards passengers. It was found that the dimensions that influence the good services were Reliability and Assurance.

Atul Choudhary (2018) found an impact of recent technological reforms in Indian Railways on its revenue and its influence on the passenger satisfaction in terms of service. Quality of customer service in Indian Railways has a significant role on the Passengers' Satisfaction. Railways could draw higher economic benefits from its operations by improving its service quality. Various studies have pronounced many dimensions concerning about the Passengers' satisfaction of Indian Railways

OBJECTIVE AND METHODOLOGY OF THE STUDY

This study tries to find out the factors that influence the quality of service provided by Indian railways. The research design is descriptive in nature. The sampling design is stratified sampling. The area of sampling is Coimbatore division. The sample size is 150. Factor analysis is a technique that is used to reduce a large number of variables into fewer numbers of factors. Factor analysis extracts maximum common variance from all variables and puts them into a common score.

RESULTS AND DISCUSSION:

Particulars	Classification	Number of Respondents	Percentage
	< 25	35	7.5
		10	10 5

Table No. 1: Demographic profile of respondents to the survey (n = 150)

1 al ticulai s	Classification	Number of Respondents	I el centage
	< 25	35	7.5
Ago	25-40	49	10.5
nge	40-60	36	7.7
	60 and above	30	6.5
	Female	65	14.0
Gender	Male	85	18.3
Marital status	Single	62	13.3
	Married	88	18.9
	School Level	1	.2

Educational	Graduation	7	1.5
Qualification	Post Graduation	86	18.5
	Professionals	56	12.0
	Student	58	12.5
Occupation	Business man	6	1.3
	Employee	85	18.3
	Others	1	.2
	Below Rs. 10000	9	1.9
Monthly	Rs.10001 - Rs.25000	49	10.5
income	Rs.25001-Rs.50000	91	19.6
level	No Income	1	.2
	Two	7	1.5
Family	Three	116	24.9
members	Four	27	5.8
	Above Four	7	1.5

Table No. 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure	.891	
Bartlett's Test of Sphericity	5.430E3	
	Df	861
	.000	

High value of KMO (0.891 > .05) of indicates that a factor analysis is useful for the present data. The significant value for Bartlett's test of Sphericity is 0.000 and is less than .05 which indicates that there exist significant relationships among the variables (Table-1). The resultant value of KMO test and Bartlett's test indicate that the present data is useful for factor analysis.

 Table No. 3 : Communalities

	Initial	Extraction
B1	1.000	.554
B2	1.000	.535
B3	1.000	.487
B4	1.000	.309
B5	1.000	.431
B6	1.000	.551
B7	1.000	.564
B8	1.000	.548
B9	1.000	.360
B10	1.000	.532
B11	1.000	.333
B12	1.000	.333
B13	1.000	.430
B14	1.000	.397
B15	1.000	.433
B16	1.000	.294
B17	1.000	.446
B18	1.000	.362
B19	1.000	.390
B20	1.000	.414
B21	1.000	.097
B22	1.000	.528
B23	1.000	.551
B24	1.000	.500
B25	1.000	.566
B26	1.000	.543
B27	1.000	.497
B28	1.000	.595
B29	1.000	.498
B30	1.000	.489
B31	1.000	.515
B32	1.000	.588
B33	1.000	.654
B34	1.000	.625

B35	1.000	.643		
B36	1.000	.552		
B37	1.000	.613		
B38	1.000	.384		
B39	1.000	.439		
B40	1.000	.655		
B41	1.000	.534		
B42	1.000	.565		
Extraction Method: Principal Component Analysis.				

Items B4, B9, B11, B12, B14, B16, B18, B19, B21 and B31are having Factor loadings less than 0.4. Hence the above items which are not contributing are removed

Compone	Initial Eigenvalues			Extractio	Rotation Sums of Squared Loadings ^a		
nt	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.356	22.987	22.987	7.356	22.987	22.987	4.779
2	2.092	6.537	29.524	2.092	6.537	29.524	5.568
3	1.994	6.232	35.756	1.994	6.232	35.756	3.746
4	1.496	4.676	40.431	1.496	4.676	40.431	3.624
5	1.429	4.467	44.898	1.429	4.467	44.898	2.515
6	1.369	4.277	49.176	1.369	4.277	49.176	1.838
7	1.163	3.634	52.810	1.163	3.634	52.810	2.445
8	1.072	3.349	56.159	1.072	3.349	56.159	1.940
9	.949	2.967	59.126				
10	.878	2.745	61.871				
11	.851	2.660	64.531				
12	.773	2.416	66.947				
13	.768	2.400	69.347				
14	.735	2.297	71.644				
15	.682	2.132	73.775				
16	.678	2.120	75.895				
17	.663	2.071	77.966				
18	.616	1.925	79.890				

Table No. 4 : Total Variance Explained

19	.587	1.834	81.725				
20	.580	1.814	83.538				
21	.555	1.734	85.272				
22	.512	1.600	86.871				
23	.500	1.563	88.435				
24	.494	1.543	89.978				
25	.473	1.478	91.456				
26	.463	1.446	92.902				
27	.444	1.387	94.289				
28	.410	1.281	95.571				
29	.394	1.230	96.801				
30	.362	1.131	97.932				
31	.347	1.083	99.015				
32	.315	.985	100.000				
Extraction Method: Principal Component Analysis.							

The next step in the process is to decide about the number of factors to be derived. The rule of thumb is applied to choose the number of factors for which 'Eigen values' with greater than unity is taken by using Principal Component Analysis method. The Component matrix so formed is further rotated orthogonally using Varimax rotation algorithm which is the standard rotation method (Kaiser, 1958). All the statements are loaded on the Eight factors.

	Component								
	1	2	3	4	5	6	7	8	
B23	.796								
B25	.757								
B22	.721								
B26	.683								
B24	.610								
B30		.708							
B31		.664							
B29		.644							
B28		.597							

 Table No. 3 : Pattern Matrix

B27		.577						
B15		.529						
B10		.435						
B20		.421						
B6			.762					
B7			.741					
B8			.722					
B37				.820				
B35				.741				
B36				.657				
B17								
B33					.786			
B34					.743			
B32					.629			
B40						.792		
B42						.787		
B41						.588		
B5							.666	
B39							.613	
B13							.515	
B1								.783
B2								.582
B3								.537
Extracti Rotatio	Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.							

In the above pattern Matrix, there are 8 factors. All factors have loaded properly. Now the factors are listed below which are taken as the dimensions of Service Quality in Indian Railways

F1 is Tangibility F2 is Reliability F3 is Connection F4 is Empathy F5 is Responsiveness F6 is Assurance F7 is Convenience F8 is Communication

CONCLUSION:

In this study, with the help of factor analysis, the researcher came out with eight factors. In addition to Parasuram, Berry and Zeithaml's five dimensions of Service Quality, three more dimensions are added which contribute to railways and they are Connection, Convenience and Communication. The dimension Connection here implies connecting trains, parking facilities, Ease of access and Frequency of trains. The dimension Convenience here implies convenience in buying tickets and. The dimension Communication here implies information regarding PNR status, Availability, Confirmation, train arrival and departure, Delay, Platform, Amount, Route etc.,

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