The Effects of Individual Dimensions of Railway Service Quality: Findings from Indian Railway Passenger Services through Developing RAILQUAL

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***Abstract*—This article investigates how reservation and ticketing, railway platform amenities, in-train-service, employee service, punctuality, safety and security in the journey determine railway passengers' service quality. Based on psychometric scale development approaches, this research conceptualized, constructed, refined and tested a multi-item scale 'RAILQUAL' that examined key factors influencing railway passenger service quality. Through qualitative and quantitative studies in three phases a 18 item six dimensions 'RAILQUAL' model was developed, which is a measuring instrument for service quality in Indian Railway Passenger Services. To address this issue, recent advances in measurement theory to dataset were applied and compared two different modeling methods were compared namely exploratory factor analysis and confirmatory factor analysis.**

***Index Terms*—Service quality, Indian railways, RAILQUAL, structural equation modeling.**

I. Introduction

Indian Railway Passenger services, in today's world find themselves in an environment that is focused on understanding the role and importance of service quality. Not oblivious to the need for adaptation to serve the interests of the passengers, in terms of greater responsiveness, responsibility, accountability and increased expectations, the Indian Railway Passenger services are being pressurized to shift their focus from quantitative expansion, to an emphasis on quality [1].

Measurement of a complex concept makes it necessary to design appropriate instruments, which involves the concept, the identification and the operation of relevant dimensions of the concept, the development of batteries of valid questionnaire items to measure each of the dimensions and the assignment of appropriate weights for each dimension [2].

In response to growing concerns from passengers about poor or inconsistent quality, the Indian Railways are increasingly realizing the significance of passenger centered philosophies and thereby, seeking ways to improve and provide better passenger service. To measure and evaluate the quality of service for improvement, the only way is to find out the level of satisfaction the passengers derive from the services [3].

Starting with theoretical background, the paper outlines the results of a study conducted on Railway passengers to obtain a perspective on the quality of Railway passenger services. Based on the literature review, followed by a pilot study, various Railway passenger requirements and design characteristics were identified to develop RAILQUAL model based on the SERVQUAL model.

Following this, the study proposes and tests a conceptual framework of the relationships between the Individual Dimensions with Indian Railways passenger service quality; Final discussion of the implications of the study concludes the article.

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II. Theoretical Background

A. Quality In Transport Services

The last two decades have witnessed increased acceptance and use of Quality in the service sector, with service quality being an important factor for growth, survival and success. However, there is a lot of confusion over the numerous orientations and perspectives in defining quality, due to its characteristics, which tend to differentiate services from goods [4]. These differences have lead to lack of standardization and the measurement of service quality remains a questionable challenge.

The SERVQUAL approach is the most common method for measuring service quality. The credit for heralding the service quality research goes to Parasuraman et al., [5]. They formulated a measure of service quality derived from data on a number of services, instead of counting on earlier dimensions of goods quality in the manufacturing sector. The entire approach was formulated on the tenet that customers entertain expectations of performances on the service dimensions, observe performance and later performance perceptions transform into satisfaction degree. SERVQUAL is much more humanistic, or customer-related, while most of the measures used in public transport industry are much more mechanistic, or have technical focus, or use more objective measures. It has been suggested that for some services the SERVQUAL instrument needs considerable adaptation [6] and that items used to measure service quality should reflect the specific service setting under investigation, and that it is necessary in this regard to modify some of the items and add or delete items as required [7]. In summary, in order to measure the quality of service thoroughly, the attributes used in SERVQUAL, the public transport industry and the railway service sector should be grouped together to form a pool of items for measurement. Hence the attributes in the SERVQUAL model were modified and new attributes were added for the creation of RAILQUAL for measurement of Railway passenger Services Quality.

B. Need to Assess Railways' Passenger Services

The Indian Railway must know what the passenger expects and to know what extent their expectations are

fulfilled. Understanding passenger needs and behavior is not an option but it is an absolute necessity for competitive survival [7]. The main problem with regard to assessing the quality of transport service quality is that it is composed of several utilities. It is not possible to evaluate and measure the quality as single unit since it is a bundle of benefits [8]. Main factors to be compared especially when competing modes are involved are travel cost, convenience, comfort, dependability travel time and safety. Since satisfaction is a function of expected performance and actual performance, market research would reveal what the users of railway passengers expect and satisfaction derived there from. By researching passenger needs and behaviors, and by asking passengers' it will be known about the system and the ways and means to serve better their needs [4].

III. Empirical Study

A. Objective

This study conducted with the objective of identifying an integrated framework that would lead to Quality in Railway passenger services, through usage of quantitative and qualitative techniques. This involved the determination of railway service quality and development of RAILQUAL.

B. Questionnaire Design and Measurement

To develop RAILQUAL in-depth interviews and focus group discussions were held with railway staff, railway passengers and academics in the transportation field. During the in-depth interviews participants were asked to express their views on rail passenger service quality – especially what comprises rail passenger service quality, what kind of service railways provide, and how railway passenger service quality differs from service quality in other service industries.

C. Passenger Survey

The survey was conducted at the Secunderabad station of South Central Railway in September2010.Sampling was done by interviewing randomly selected passengers, at different times of day, on every day of the week, over a 3-week period. A total of 234 questionnaires were found complete and valid for analysis.

D. Variable Conceptualization and Instrument

Based on literature review, and with particular emphasis on the various models and performance indicators in rail transport,variables and items for the study were conceptualized.These items were adapted and incorporated in the questionnaires that were distibuted to the passengers to examine the validity and reliability of the scale during the pilot study stage to enable a quantitative and statistically proven identificaiton of passenger requirements. After focus group discussions 45 attributes were identified in which 9 were deleted after taking expert opionions. The following 36 modified attributes to suit Railways have been identified for developing RAILQUAL scale with literature review, focus group discssions and taking expert opinions.

E. Railqual Theory Building throug Exploratory Factor Analysis

Data analysis proceeds in two steps. First the exploratory factor analysis was used to identify the underlying dimensions of services quality of railway passenger services. For this the sample was split into two approximately equal sub samples: sample1 (n=117) and sample 2 (n=117) this was done by randomly selecting ~50 percent of the cases using the filtering algorithm in SPSS.

TABLE I: Identified attributes

1.convenience of reservation and ticketing
2.promptness and accuracy in reservation and ticketing
3.provision of information about train times/platforms
4.the upkeep/repair of station buildings and platforms
5.ticket purchasing facilities
6.amenities at the station
7enquiry handling at ticket counter
8.train departure on time
9.the length of time the journey was scheduled to take
10.train arrival on time without late (ie itinerary accuracy)
11.convenient train schedule
12.connections with other train services
13.catering and other facilities at station
14.condition of fans and air conditioners
15.train availability
16.the space for luggage
17.coach maintenance
18.connections with other forms of public transport
19.the ease of being able to get on and off the train at station platform
20.courtesy of employees
21.how request to railway staff was handled
22.the attitudes and helpfulness of the railway staff
23.cleanliness of the train
24.the toilet facilities
25.the easiness of ticket purchasing
26.availability of railway staff on train
27.the comfort of seating area (ie berths and seats)
28.the provision of information during journey
29.journey comfort
30.quality and price of catering in train
31personal security at the station
32.facilities for parking
33.personal security on train
34.safety of train journey
35.the value of money for price of your ticket
36.security of luggage on train

Next an exploratory factor analysis was performed on 36 attributes of the measurement scale using principal component analysis with varimax rotation. An orthogonal rotation was chosen for the sake of simplicity. Next, confirmatory factor analysis was used to confirm the factor structure of the service quality dimensions. Qualitative validity was tested through the theoretical study as well as through expert comments. The test for quantitative validity was done through an Exploratory Factor analysis. The principal component method was used. With Eigen values above 1 and the maximum iterations for convergence as 100, the Varimax Rotation was applied and Rotated factor

loadings examined. Factor loadings above α value of 0.60 were considered. Internal consistency was examined through a reliability analysis. The Cronbach's α model, inter-item-correlation and covariance were used and alpha values over 0.70 were considered [9].

As far as passenger requirement were concerned, the validity and reliability identified a total of 36 items which grouped under six factors/constructs. The Cronbach's α values for the different factors of passenger requirements ranged from 0.711 to 0.854 indicating that the scale was internally consistent and reliable[9].

TABLE II: THE RESULT OF FACTOR ANALYSIS

RAILQUAL ATTRIBUTES	RAIL QUAL DIMENSIONS					
	1	2	3	4	5	6
X23	.814					
X24	.697					
X29	.602					
X30	.680					
X3		.735				
X4		.668				
X6		.648				
X18		.702				
X33			.807			
X34			.753			
X36			.712			
X8				.697		
X9				.747		
X10				.635		
X12				.702		
X1					.681	
X2					.751	
X21						.775
X22						.630
Cronbach alpha	.854	.826	.807	.832	.804	.711

This resulted in the development of service quality dimensions and measurement items suitable for the railway passenger sector. The Instrument for measuring railway passenger quality encompasses six dimensions namely reservation and ticketing, railway platform amenities, in-train-service, employee service, punctuality, safety and security in the journey.

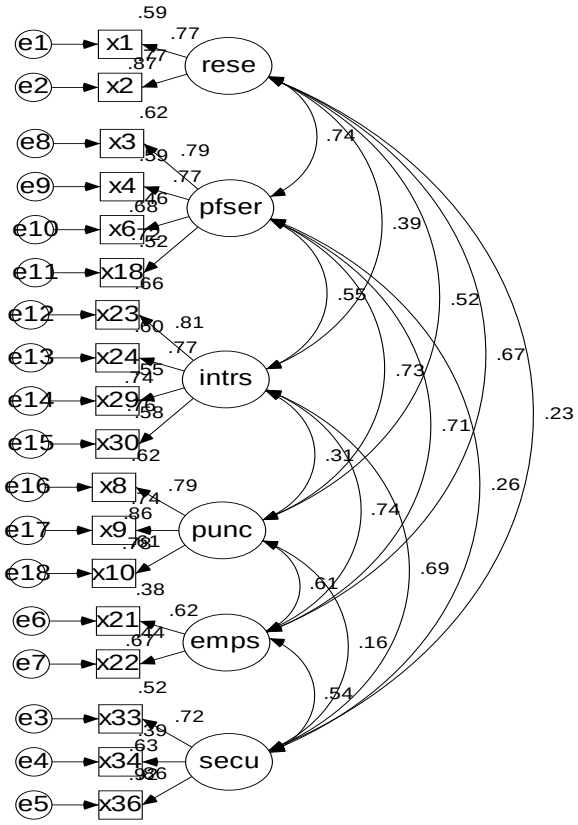
F. Railqual Theroy Tesing through Confirmatory Factor Analysis

After identifying six clear factors through exploratory factor analysis, the next stage is to confirm the factor structure on sample 2. Structural equation modeling (SEM) using AMOS 16.0 was used to perform the confirmatory factor analysis. Confirmatory factor analysis revealed that the measurement attributes loaded in accordance with the patter value in the factor analysis.

Model Fit

The measurement model indicated an acceptable fit of the data (*Chsquare* =1195.179, *df* = 120, *p* <0.001, *GFI*=.904; *AGFI*=.863; *CFI*=.905; *TLI*=.878; *IFI*=.905; *NFI*=.895; *PNFI*=.702; *PCFI*=.795; *PRATIO*=.784 and *RMSEA*=.46) [9].

In addition all the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data [10]. In short the measurement model confirms to the six factor structure of the service quality instrument RAILQUAL.



Rese =Reservation and Ticketing; pfser=Platform Services, Intrs=in train services; punc=punctuality ;emps=employee ervices ;secu=security and safety;

Fig. 1. The result of confirmatory factor analysis.

G. Reliability of the Railqual Instrument

The Cronbach's alpha for the RAILQUAL was 0.81 which is acceptable and shows that the instrument is reliable. Composite reliability (CR) of all the latent dimensions is greater than the acceptable limit of 0.70. The average-variance extracted for all the factors is greater than or equal to 0.6, which is acceptable. [11].This shows the internal consistency of the statement used in the study.

H. Construct Validity

Construct validity is the extent to which a set of measured variables actually reflects the latent construct they are designed to measure [12].Construct validity is established in this study by establishing the face validity, convergent validity and discriminant validity.

Face validity was established by adopting the measurement items used in the study from the existing literature and adopting the same to the present research context.

Convergent validity was assessed by examining the factor loadings and average variance extracted of the constructs. All the indicators had significant loadings onto the respective latent constructs (*p*=0.001) with values varying between0 .62 to 0 .95), In addition ,the Average Variance Extracted (AVE) for each dimension is greater than or equal to 0.55,which further supports the convergent validity.

Discriminant validity can be assessed by comparing the Average Variance Extracted (AVE) with the corresponding inter-construct squared correlation estimates. The AVE values of all the service quality dimensions are greater than

the inter-construct correlations, which supports the discriminant validity of the constructs. Thus, the measurement model reflects good construct validity and desirable psychometric properties.

IV. Conclusion

The study has presented a model of individual dimension of Railway passenger service quality. This study disclosed that there is significant relationship between in-train service, Employee service, Train punctuality, platform amenities, Reservation and Ticketing and safety and security are having significant positive influence on overall Railway passenger service quality. The Railway administration feels that the passenger is pleased with if a few new trains are announced at regular intervals and fares are kept low. But there must be at least being basic facilities at stations and trains. The chaos at the railway station is due to the lack of attention paid to their running.

The platforms at major stations are arguably among the dirtiest in the world. They lack proper signage, seating facilities and communication mechanisms. Lifts and escalators are nonexistent in most stations though the Railways are the most preferred option for long distance travel in India. More personnel need to be deployed not just to manage crowds but also to help passengers with precise information. Proper communication between officials and passengers itself could streamline passenger flow and facilitate better patronage. But these are possible only if policies and priorities are set with the passenger in focus. A public utility like the Railways has to be judged not merely on the bottom line, but on the quality of service it provides. The unfortunate part is even when the Railways have claimed operational profits; its record on passenger amenities was nothing to crow about. The Railways has to revolve around the passenger. The passenger must be seen as consumer with privileges and not as a captive user with limited choices.

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