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## **A Hierarchical Model of Service Quality of Indian Railways website: Mediating Role of Customer Satisfaction**

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### **Abstract**

The aim of this research paper is to reassess the multiple-item scale (E-S-QUAL) for measuring the service quality delivered by the Indian Railways Web site. Conceptually, we studied service quality as a hierarchical, reflective construct, incorporating efficiency, fulfillment, privacy, and system availability. The data was collected from 151 participants using an online questionnaire. To assess the parameters of a hierarchical, reflective model with mediating effects, we used the partial least squares structural equation modelling (PLS-SEM) with bootstrap method. The results showed that service quality is a second-order, reflective construct that has a significant direct and indirect effect on customer loyalty. It also confirms that customer satisfaction plays the key, mediating role between service quality and customer loyalty. Finally, we conclude by discussing theoretical contributions, managerial implications, limitations, and future research directions of the study.

**Key words:** service quality; customer satisfaction, Hierarchical Model, Indian Railways,

### **Introduction**

Services sector covers an extensive range of activities from the most complex information technology (IT) to simple services such as the services of the barber and plumber. Transportation contributes significantly to services sector and the overall development of a nation's economy. In India, Rail and Road transport dominate the passenger transport system. Passenger traffic by rail and road increased from 32 percent in 1951 to 90 percent in 2013 (Indian transport Report 2014). Rail transport has emerged as a second largest mode of passenger transport after road transport in India. Rail transportation contributes 8 percent to the annual national GDP.

Indian Railways statistical publications (2016) reports that Indian Railways transports 8.107 passengers annually and is the fourth largest rail network after USA, Russia, and China. Indian Railway Catering and Tourism Corporation (IRCTC), a ticketing website, is a subsidiary of the Indian Railways that handles the catering, tourism and online ticketing operations of the Indian railways. IRCTC website is capable of booking 15000 tickets a minute, 13.40 lakh e-tickets in a day and can handle 3 lakh concurrent users (India Times Nov 2016) In fact, 55 percent of all tickets sold are booked online.

In view of the role and importance of the IRCTC portal's services in the overall service delivery of the Indian Railways, a study has been conducted to evaluate the service quality and customer satisfaction of its users. Although significant research has been conducted on satisfaction, service quality, and customer loyalty, lack of research studies in measuring the impact of e-service quality

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on customer loyalty through customer satisfaction is the prime motivation for this study. The present research focuses on the impact of e-service quality on customer loyalty to IRCTC through satisfaction. The present study contributes to the literature by addressing three research questions. *First*, is E-S-QUAL (multiple-item scale) an appropriate scale to measure the service quality delivered by the IRCTC website? *Second*, can service quality be considered as a second-order, reflective construct? *Finally*, does customer satisfaction mediate the relationship between service quality and loyalty?

### **Service Quality**

Unlike goods evaluating quality of a service is difficult researchers such as (Lehtinen and Lehtinen 1982, Grönroos and Shostack 1983, Parasuraman, Zeithaml, and Berry 1985b) who are working to disentangle the factors that found to be influencing service quality and to provide a number of actionable tools to firms to measure its performance. Service quality (Gronroos 1993, Parasuraman 1998) is defined as a comparison between customer expectation and perception of service. The SERVQUAL scale proposed by (Zeithaml, Berry, and Parasuraman 1988, Parasuraman, Zeithaml, and Berry 1985a) based on the disconfirmation of expectations model (Oliver 1980) is widely used to measure service quality. The SERVQUAL scale contains 22 items under five dimensions including tangibility, reliability, responsiveness, assurance, and empathy.

Richard and Allaway (1993) argue that the five dimensions scale is an inadequate tool for measuring a firm's total service quality and also found that Parasuraman, Zeithaml and Berry's model measuring both process and outcome quality was more reliable than the model that measured only process quality. Grönroos (1993) summary of service quality is based on "what" and "How" questions "What" addresses the Technical Quality "How" addresses the functional Quality.

Cronin and Taylor (1992) re-examined the measurement of service quality and concluded that service quality should be treated as an attitude and criticized that SERVQUAL model as it is based on the satisfaction paradigm rather than an attitude paradigm. Cronin and Taylor conceptualized perceived service quality, SERVPREF which explains more of variation in service quality than SERVQUAL. Taylor and Baker (1994) identified that customer satisfaction moderates between service quality and purchase intention, and concluded that highest level of purchase intentions appear when service quality and satisfaction judgments are high. Rust and Oliver (1994) offer a three-component model: the service product (i.e., technical quality), the service delivery (i.e., functional quality), and the service environment.

### **Website Service Quality**

Dabholkar (1996) draw upon the SERVQUAL model in order to generate a pool of quality items based on an analysis in the field of e-services, the authors extracted seven key dimensions; website design, reliability, delivery, ease-of-use, enjoyment and control for measuring e-services quality. To measure online retail services Zeithaml, Parasuraman, and Malhotra (2000) identified seven dimensions namely efficiency, reliability, fulfillment, privacy, responsiveness, compensation and contact which significantly measures online service quality. Jun and Cai (2001) investigated service quality of online banking services by measuring website design, information, ease of use, access, courtesy, responsiveness and reliability. Wolfenbarger and Gilly (2003) examined the dimensions website design, reliability, security and customer service to assess online shopping

sites service quality. Using SERVQUAL model Li, Tan, and Xie (2002) developed a new scale by identifying important items and dimensions in web-based service quality measurement from customers' perspectives, with six dimensions: Responsiveness, Competence, Quality of Information, Empathy, Web Assistance and Call back Systems. Surjadajaja, Ghosh, and Antony (2003) examined the service quality of e-services.

Yang and Fang (2004) study mentioned the following dimensions - responsiveness, reliability, ease-of-use, competence, security and product portfolio to measure online shopping sites. The authors specified that the five-dimension SERVQUAL model is not completely generic and stable. Kuo et al. (2005) identified that perceived service quality is the most effective indicator to model portal customer satisfaction, the success of portals is closely related to four factors: information quality, accessibility, ease of use, and empathy and among them Information quality is the most important factor for customer satisfaction. Yang et al. (2005) identified the dimensions usability and accessibility which significantly influences overall service quality perceptions of web portal users in terms of information retrieval and delivery systems and stressed on quality and quantity of the content. Based on the explorative study by (Zeithaml, Parasuraman, and Malhotra (2002), Parasuraman, Zeithaml, and Malhotra 2005) provide the most comprehensive work on e-service quality so far. They empirically tested a multiple item scale (E-S-QUAL) for assessing service quality of online shopping providers. Their findings correspond to the insights of their explorative study: two different scales are necessary to measure electronic service quality. The E-S-QUAL scale addresses core service quality aspects and consists of four quality dimensions (efficiency, fulfillment, system availability and privacy).

Bauer, Falk, and Hammerschmidt (2006) studied the shopping motives of online shoppers and identified that hedonic quality aspects has significant impact on evaluating online shopping experiences and quality perceptions, a dimension which was not considered in E-S-Qual (Parasuraman, Zeithaml, and Malhotra 2005) and e-TailQ (Wolfinbarger and Gilly 2003). Ho and Lee (2007) identified that website functionality and customer relationships were the two most important factors in evaluating e-travel service quality, online customers get dissatisfied if the site is not accessible or cannot be navigated easily. Liu, Du, and Tsai (2009) identified that service quality of general portals and business portals differ and a separate scale is needed to measure each of these portals, the authors have developed a scale which measures service quality of general web portals and different service quality constructs of customer satisfaction were identified. Tarigan (2009) investigated user satisfaction in e-library system and examined the association between user satisfaction and quality dimension of WEBQUAL

Kim and Niehm (2009) examined relationships among website quality, perceived information quality, perceived value, and loyalty intentions in the context of apparel online shopping and identified that website quality dimensions, interactivity, online completeness, ease of use, and entertainment significantly influence perceived information quality and hence Perceived information quality influences perceived value and loyalty intentions toward apparel retail websites. Bhattacharya, Gulla, and Gupta (2012) studied e-service quality of government transactional portals in India by assessing the demand side service quality of government portals and postulated that citizen eccentricity and usability of government web portals have a positive influence on e-service quality.

Cho (2014) examined the relationship between customer perception of Internet retailers' service quality and customer price perception the author studied the scope of service quality at three stages of service interaction: first, a retailer's home page presentation; second, the overall retail website, and third, the retailer's order-fulfillment quality and the results showed that both the presentation of an effective home page web format and the customer perception of a retailer's order procurement quality are significantly associated with customer price perception.

## **Hypotheses Development**

The theoretical frame work of the present study is developed based on the adaptation of the Stimulus- Organism-Response (S-O-R) Model (Mehrabian and Russell 1974) and the service quality literature. Mehrabian and Russell (1974) recommended that environmental stimuli (S) lead to an emotional reaction (O) that evokes behavioral responses (R), the S-O-R model has been applied in various retail settings to explain the consumer decision making process (Chebat and Michon 2003, Richard et al. 2010). Based on this notion we posit the website service quality (Efficiency, fulfillment, system availability, privacy) as stimulus, they affect the emotional responses of the consumer i.e. customer satisfaction as an organism and final actions, reactions, or responses emitted i.e. attitudinal loyalty as a response.

### ***Relationship between service quality and loyalty***

Researchers proved the positive relationship between service quality and customer loyalty (Baker and Crompton 2000, Zeithaml, Berry, and Parasuraman 1996). On the other hand, Cronin and Taylor (1992) stated that service quality has no significant effect on repurchase intentions. Yu, Chang, and Huang (2006) investigated and identified that service quality and overall customer satisfaction have significant relationship with customer loyalty in the context of leisure industry Akbar and Parvez (2009) investigated the effects of service quality, trust, and customer satisfaction on customer loyalty. They found a significant positive relationship between them. Based upon the above discussion, the following hypothesis is proposed:

H1: Service quality is positively related to attitudinal loyalty

### ***Relationship between service quality and satisfaction***

While some suggest that satisfaction drives quality, the preponderance of evidence indicates that quality drives satisfaction Dabholkar, Thorpe, and Rentz (1995). Overall the service quality →satisfaction causal order receives considerable support and empirical validation (Brady, Robertson, and Cronin 2001, Gotlieb, Grewal, and Brown 1994). Further, the quality → satisfaction link holds up across different cultures and explains more variance in customer loyalty (Brady, Robertson, and Cronin 2001). Therefore, the second hypothesis is:

H2: Service quality is positively related to customer satisfaction

### ***Relationship between satisfaction and loyalty***

The existing studies are classified into one of three model structure types (Cronin Jr, Brady, and Hult 2000): a satisfaction model, a value model, or an indirect model. In satisfaction models, consumption is the outcome (consequences-like behavioral intentions) measures. Value models feature perceived value, and service perceptions to consumption outcomes (Brand, Cronin, and Routledge 1997).

H3: Customer satisfaction is positively related to loyalty

### ***Mediating role of satisfaction***

Turk and Avcilar (2009) examined the impact of service quality of audit firms on customer satisfaction and behavioural intentions. They found that customer satisfaction has a mediating effect on the relationship between perceived service quality and customer loyalty. Whether satisfaction drives quality, or quality drives satisfaction (Dabholkar, Thorpe, and Rentz 1995) is still a subject of debate in the scientific community though majority of the studies supports the later argument. Turk and Avcilar (2009) examined the effects of service quality, trust, and customer satisfaction on customer loyalty. Their study concluded that the interaction between service quality and customer satisfaction explains more of the variance in customers' stated purchase intentions than the direct influences of either service quality or satisfaction alone (Akbar and Parvez 2009, Söderlund 2006).

H3: The relationship between service quality and loyalty is mediated by customer satisfaction.

## **Method**

### ***Research Design***

The cross-sectional and quantitative data collection method directed the present research design. Self-reported questionnaires were used to measure the constructs, test the hypotheses and infer the associations of relationships among the constructs.

### ***Participants***

Post graduate students from universities and employees from both public and private sector organizations are the target population for this study. The data was collected from 151 participants using online questionnaire. Of the participants, 60% were students, 40% were employees, 79% were male and 21% were female, the average age was 31, which ranged from 22 years to 63 years, the average annual family income was Rs. 465000, which ranged between Rs.30,000 to Rs. 20,00,000.

### ***Measures***

Service quality constructs were adapted from the E-S-QUAL scale (Parasuraman, Zeithaml, and Malhotra 2005) and measured on seven-point Likert scales (1 = strongly disagree; 7 = strongly agree). Customer Satisfaction (four items) measures were adopted from (Brady and Cronin 2001) each item is measured by using a 10-point semantic differential response format. The loyalty (five items) construct was measured through Behavioral Loyalty Scale developed by (Zeithaml, Berry, and Parasuraman 1996). The scale is anchored between 1= very unlikely to 5 = very likely.

### ***Operationalization of constructs***

*Efficiency*- the ease and speed of accessing and using the site (Parasuraman, Zeithaml, and Malhotra 2005); *Fulfillment I*- the extent to which the site's promises about order delivery and item availability are fulfilled (Parasuraman, Zeithaml, and Malhotra 2005); *System availability*- the correct technical functioning of the site (Parasuraman et al., 2005); *Privacy*-the degree to which the site is safe and protects customer information; *Customer Satisfaction*- the contentment of the customer with respect to his or her prior purchasing experience with the firm (Oliver 2010); *Loyalty*- the customer's repeat buying behavior and intention to revisit a website or to make a transaction from it in the future (Cyr et al. 2007).

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## Data Analysis

To evaluate the hierarchical model of service quality Smart PLS V3 version was used (Ringle, Wende, and Will 2005) to estimate the parameters in the outer and inner model. Then, we applied non-parametric bootstrapping with 5000 replications to obtain the standard errors of the estimates (Wetzels, Odekerken-Schroder, and Van Oppen 2009). The research model (indirect effect) was tested through process macro in SPSS 21.0 version (Preacher and Hayes 2008). Indirect effects are considered significant at  $p < .05$  when the 95% confidence interval (CI) for the indirect effect does not include zero. The reliability and validity of the measurement model is tested using the guidelines provided by Straub, Boudreau, and Gefen (2004). To address common method bias, we applied Harman 1-factor test (MacKenzie and Podsakoff 2012) on four first-order latent variables in our research model. This test found no significant biases in the dataset because there was no common factor loading on all the measures. Hence, this study free from the common method bias.

## Results

### Assessment of measurement model

The properties of the reflective measurement models examines its reliability and validity (Henseler, Ringle, and Sinkovics 2009). In this study, reflective indicators and dimensions satisfy the requirements (Table 1), all the item loadings were larger than .7 and ranged from .72 to .97. The assessment of construct reliability uses composite reliability (ranged from .89 to .98) and Cronbach's alpha (ranged from .84 to .97) both exceeded the cut-off values of .70 (Tenenhaus et al. 2005). In this research, all reflective constructs and dimensions are reliable (Table 1).

**Table 1. Psychometric properties for first-order constructs**

Constructs	Items	Loadings	T statistics	Alpha	CR	AVE
Efficiency	EF1	.79	17.46	.86	.90	.63
	EF2	.77	19.22			
	EF3	.81	29.28			
	EF4	.79	20.45			
	EF5	.83	22.70			
Fulfillment	FF1	.86	33.98	.86	.90	.70
	FF2	.82	18.22			
	FF3	.85	29.02			
	FF4	.82	23.20			
Privacy	PY1	.87	36.82	.86	.92	.78
	PY2	.91	48.63			
	PY3	.87	42.14			
System Availability	SA1	.83	31.03	.88	.91	.62
	SA2	.79	22.26			
	SA3	.76	15.74			
	SA4	.76	20.15			
	SA5	.74	15.49			

	SA6	.83	34.35			
Satisfaction	SAT1	.95	92.39	.97	.98	.92
	SAT2	.96	62.47			
	SAT3	.97	162.03			
	SAT4	.97	155.04			
Loyalty	LOY1	.75	11.65	.84	.89	.61
	LOY2	.83	25.62			
	LOY3	.72	13.74			
	LOY4	.82	29.37			
	LOY5	.78	18.51			

Note: CR = Composite Reliability, AVE = Average Variance Extracted, \*\*p<.001.

To assess the convergent validity of the measurement model, we calculated average variances extracted (AVE) for each construct, Efficiency (.634), Fulfillment (.696), Privacy (.782), System Availability (.615), Satisfaction (.924) and Loyalty (.611) respectively. All met the recommended minimum level of 0.5 (Fornell and Larcker 1981). Hence, all reflective constructs and dimensions attain convergent validity. Table 2 shows the results of the discriminant validity assessment, we calculated the square root of the AVE that exceeds the inter-correlations of the construct with the other constructs in the model to ensure discriminant validity (Fornell and Larcker 1981). Thus, the measurement model was considered satisfactory with the evidence of adequate reliability, convergent validity, and discriminant validity.

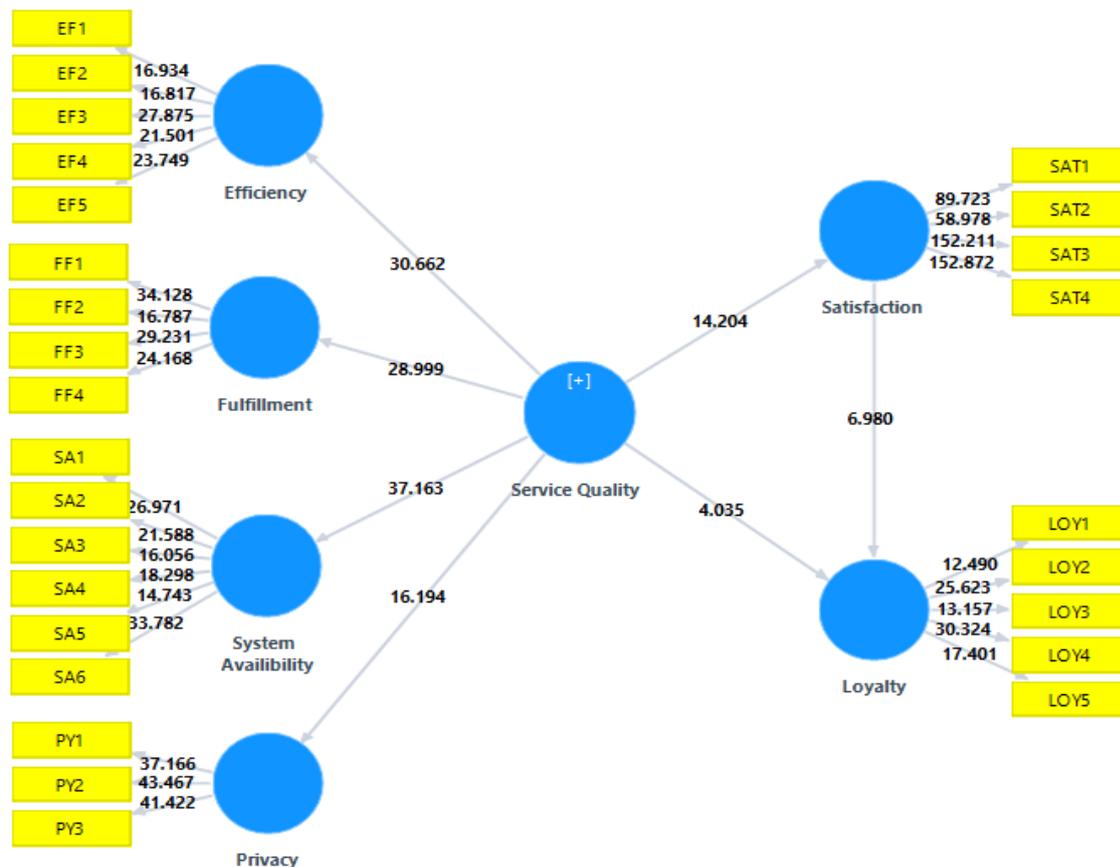


Fig 1. Measurement Model

**Table 2. Mean, standard deviation, inter-correlations of the latent variables for the first-order constructs**

Constructs	M	SD	1	2	3	4	5	6
(1) Efficiency	5.17	1.47	<b>.80*</b>					
(2) Fulfillment	5.06	1.45	.63	<b>.84*</b>				
(3) System Availability	4.06	1.72	.66	.58	<b>.88*</b>			
(4) Privacy	5.32	1.26	.50	.58	.49	<b>.78*</b>		
(5) Satisfaction	7.13	2.13	.63	.57	.59	.63	<b>.96*</b>	
(6) Loyalty	3.74	1.02	.59	.56	.53	.60	.74	<b>.78*</b>

\*Square root of the AVE on the diagonal

### **Assessment of the hierarchical model**

In this study, we specify service quality as a second-order, hierarchical reflective construct (reflective-reflective type), which comprises four first-order reflective constructs (efficiency, fulfillment, system availability, and privacy). Thus, the degree of explained variance of this hierarchical construct is reflected in its components, that is, efficiency (74.3%), fulfillment (69.1%), system availability (74%), and privacy (53.6%). All the path coefficients from service quality to its components are significant at  $P < 0.01$  (Table 1).

**Table 3. Second-order Overall Service Quality construct and its association with first-order components**

Efficiency	Fulfillment	System Availability	Privacy
$R^2 = .742$	$R^2 = .691$	$R^2 = .740$	$R^2 = .536$
$\beta = .862$	$\beta = .831$	$\beta = .860$	$\beta = .732$
$P < .01$	$P < .01$	$P < .01$	$P < .01$

### **Assessment of Structural Model**

The variance explained by the model ( $R^2$ ) is a key criterion for evaluating the structural model's quality. The coefficient of determination ( $R^2$ ) for the target construct, satisfaction, lies at a very satisfactory level, with a value of 51.6%. Furthermore, the model accounts for 59% of the variance in loyalty. In Figure 2, the results give a standardized beta of .68 from service quality to loyalty, .72 from service quality to satisfaction, and .52 from satisfaction to loyalty. Thus, results support H1, H2 and H3. In addition, the results also confirm that the structural model has satisfactory predictive relevance for the loyalty ( $Q^2 = .33$ ).

### **Mediation Effect**

The study used Hayes, Preacher, and Myers (2011) analytical approach to test the mediation hypotheses (H4). Figure 1A shows the total effect (c) of Service quality on loyalty. Figure 1B expresses the total effect of service quality on loyalty as the sum of the direct ( $c'$ ) and indirect effect (ab). The estimation of the latter uses the product of the path coefficients for each of the paths in the mediational chain.

Table 4 Path Coefficients and Indirect effect for Mediation Models

	Direct Effect		Indirect Effects	
	Path		Estimate	Percentile 95% confidence interval
	Coefficients			
	Satisfaction	Loyalty		
Service Quality	0.72 (11.77)	0.31 (3.19)		
Satisfaction		0.52 (5.56)		
Total			0.68	[0.12, 0.49]
SQ-> SAT-> LOY			0.37	[0.23, 0.54]

SQ = Service Quality, SAT=Satisfaction, Loy Loyalty.

As Figure 2A and Table 4 show, service quality has a significant total effect on loyalty ( $c = .68$ ). When adding the mediators (Figure. 2B), service quality decreases its influence, but maintains a significant direct effect on loyalty ( $c' = .31$ ). Therefore, this result supports H4 and the indirect effects of service quality on loyalty in the research model are significant. Consequently, Table 4 shows that satisfaction partially mediate the relationship between service quality and loyalty.

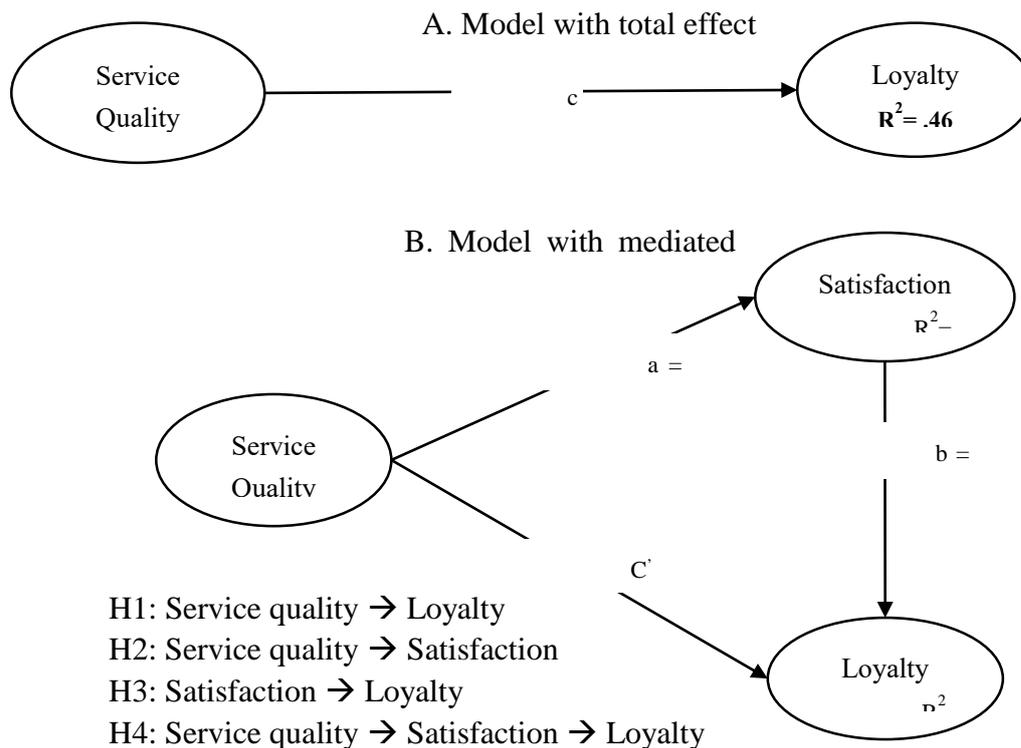


Figure 2 Structural Model with total effect and mediated effect

### Discussion

In this paper, we have reassessed the multiple-item scale (E-S-QUAL) for measuring the service quality delivered by the IRCTC website. Among all the dimensions of service quality, efficiency ( $\beta = .862$ ) is the most significant factor, followed by, system availability ( $\beta = .860$ ), fulfillment ( $\beta$

= .831) and privacy ( $\beta = .732$ ) and predictability (.33) in Loyalty.

Efficiency and system availability plays an important role in satisfying the customer and to retain them. This finding is supported by Parasuraman, Zeithaml, and Malhotra (2005) who believe that efficiency and system availability are critical contributors to customers' perceptions of overall quality and loyalty intentions. Companies should focus more on web site design features, system availability and must be proactive in identifying the aspects of system availability that are beyond their control and develop an appropriate communication scripts to reconcile customers' complaints

This research incorporated the concept of the S-O-R framework to understand customers' perceptions of service quality and customer loyalty. This supports the findings of many researchers who have found that service quality and consumer satisfaction affect consumer. Our study revealed that the Stimulus, website service quality dimensions ((Efficiency, fulfillment, system availability, privacy) affect the emotional responses of the customer satisfaction (organism) and final actions, reactions, or responses is customer loyalty. The study has confirmed adequate measurement and structural results for the research model. It shows that service quality is a second-order reflective construct which has a significant impact on satisfaction and loyalty in a hierarchical model. It also confirms that the hierarchical reflective model with mediating effects can easily be estimated using PLS path modeling. In summary, the result show that customer satisfaction was partially mediating between service quality and loyalty. This finding is supported by Ariff et al. (2013) this mediating effect involved website aesthetic and guide of e-service quality, indicating elements of graphics, visual, user guidance provided in the website are important and they can contribute to the loyalty through satisfaction. The results suggest that there could be some other variables be added to strengthen the relationship between service quality and loyalty.

### **Implications**

The present study extends the service marketing literature. With regard to managerial implications, the results show that the service firm should develop the service quality dimensions, especially efficiency and system availability, so as to avoid, or minimize customer switching behaviour and to maximize customer satisfaction and loyalty, thereby maintaining or increasing transactions with the firm.

### **Limitations and future research**

This research has a series of limitations in its results and conclusions. The cross-sectional (rather than longitudinal) design of the study might misrepresent variables that refer to lengthy processes, the effects of which only become apparent over long periods. An appropriate idea would be for future studies to adopt a longitudinal approach when analyzing these matters. Although the current research model explains 55.9% of the variance in loyalty, we expect to further improve the prediction power by incorporating additional constructs, such as image, trust, perceived value. Finally, it would be useful for future research to compare the performance between component-based SEM (PLS) and covariance-based SEM in terms of hierarchical modeling with moderation and mediation effects under different research conditions.

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