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The Cause Effect Relationship Model of Service Quality in relation with Overall Satisfaction

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Abstract

Public transportation has become one of the cornerstones of a country's infrastructure development. In particular, road transportation plays a critical role in developing countries, as large numbers of people use bus transportation as the means to commute between one place to another for work, home, visiting friends, trips etc. Ensuring the service quality in this service, therefore, is crucial. There are limited scientific studies, however, on the service quality of intercity passenger transport in India, especially with regard to infrastructure aspects. In this paper we attempt the cause effect relationship model of service quality in relation with overall satisfaction of intercity bus transport. Results demonstrate three types of passenger profile emerging from the data (K-means clustering). According to findings of the study, the service quality dimension such as empathy, information reliability, luggage assurance, responsiveness, service time reliability, external tangibles and tangibles exhibit the cause effect relationship with respect to overall satisfaction of passengers with technology mediation. It also indicates that, Technology alleviates the influence of responsiveness and environmental dimensions on overall satisfaction. A comprehensive service quality model is built, consisting of core service quality dimensions and external dimension such as technology, policy and road infrastructure for intercity bus transport, a contribution is made to public transport literature. This helps the intercity transport organizations to devise a strategy for service quality for competitive edge.

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Keywords: Service Quality; Intercity bus transport; public transport; transport policy; bus transport.

Introduction

Transport is an important entity of infrastructure and a developed transport network encourages speedy and satisfactory movement of men and material (Namboodiri, 2007). There is a growing demand for transport which provides business accessibility and safe mobility, with minimum negative impacts on natural social and the artificial environment (Hubschneider et al, 2011). The major goal of public transport policy is to satisfy the demands of passengers (Kaushik, 2015). Customer perception about fulfilling the service expectations is influenced by the service quality of the transport industry (Czepiel, 1990; Parasuraman et al., 1988). In India's comprehensive surface transport network, intercity bus transportation holds important place because of its potential in connecting cities, smaller communities, rural areas and less populated regions (Fravel, 2003). Service quality perception varies between

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developed and developing nations due to differences in service delivery environment (Das & Pandit, 2016). Therefore, context specific service quality models should be developed because of the influence of attributes such as lifestyle, individual characteristics, journey type, service performance perception about transport modes and other situational factors on transport choice (Dabholkar et al., 1996; Dagger et al., 2007). There are no sufficient studies which builds up service quality of bus transport with respect to passenger perception (Das and Pandit, 2016).

Literature Review

According to Parasuraman et al., (1988), service quality is a global judgment regarding the superiority of the service and evaluations of the outcome of service received by the customer and proves of its delivery. Satisfaction in the passenger's perception is determined by the cost, travel distance, purpose and frequency (Ponrahono et al., 2016). Cronin and Taylor (1992) introduced SERVPERF model with the argument that service quality should be measured as an attitude and reinforced the perception-based measurement of service quality. There is a need to develop service quality measurement model in accordance with nature and characteristics of road public transport services (Bakti et al., 2015). Clemes et al., (2008) suggests conducting more research regarding service quality measurement model for road public transport because different passengers evaluate the service quality differently due to differences in their characteristics. Reliability is the ability to deliver guaranteed services accurately, dependably, consistently according to the promised schedule and in a timely manner without making mistake each time (Parasuraman et al. 1991). According to Freitas et al. (2013), the aspects such as customer handling ability, politeness, courteous, information dissemination and issue redressal are important for assurance. According to Parasuraman et al. (1991), tangibles are those entities associated with the service delivery such as appearance of personnel and physical facilities, equipment, physical and communication materials. According to Leong et al. (2015) willingness of offering individual service to each customer by the service organization is termed as empathy.

According to Parasuraman et al. (1991), the employees will and desire to help the customers by providing adequate services needed to them is termed as a responsiveness dimension of service quality. Perceived value is defined as the products' utility assessment by the customers based on perception about benefits received for the cost given (Zeithaml, 1988). He also argues that by increasing perceived benefits or reducing perceived costs, perceived value by customers can be improved. Research studies indicate that by promoting the use of public transport problems like air and noise pollution caused by traffic congestion, parking issues and energy consumptions can be reduced (Chapman, 2007; Black and Black, 2009; Nocera, 2011). Passenger miles per gallon in intercity bus is two times more than the fuel efficiency of intercity rail and four time higher than the domestic air carriers (Woldeamanuel, 2012). Preferences values, and needs of individuals change over time and varies among groups and cultures (Steg et al. 2005). Generally intercity buses are designed for comfort since they hold passengers for significant time period on long journeys for example, sleeper buses (Carreira et al., 2013). Road is one of the major infrastructure of the country and large number of surface transport happen on roads. By evaluating existing quality level in the service provision and constructing corresponding policies and strategies will improve the service quality (Morton et al., 2016). Technology has the potential to advance the sustainability of services by enabling the delivery of values which benefits service providers and customers (Adi et al. 2014). Passengers using internet evaluates the quality of road transportation through availability of travel related information like bus transport firm, travel distance, date and time of travel (Zeithaml et al., 2002).

Service quality is positively related to customer satisfaction in the context of public transport (Khurshid et al., 2012). Behavioural intention is directly influenced by service quality which can be used to explain the passengers perceived satisfaction with the bus service effectively (Minser and Webb, 2010; De Oña et al., 2015; Lai and Chen, 2011; Morton et al., 2016). We find lack of a comprehensive model on measuring service quality of intercity bus passenger transport and its cause effect relationship on overall satisfaction of the service by taking all important dimensions such as service quality dimensions, technology, road infrastructure, and policy aspects. For a high population country like India, encouraging more public transport and reducing the dependency on private vehicles becomes important because transport sector is one of the major contributors of environmental degradation. A model for measuring the service quality of intercity transportation may help in considering all important dimensions and their

impact on overall satisfaction of the transport service. This may help in bringing harmony in transport service users, transport service providers and as a whole, society and planet.

The objective of the study is to attempt the cause effect relationship model of service quality in relation with overall satisfaction of intercity bus transport. It addresses the research questions namely, a. What is the cause effect relationship model which addresses the service quality dimensions, technology and satisfaction attributes of intercity bus passenger transport? b. What is the cause effect relationship model which addresses the service quality dimensions, transportation and infrastructure, technology and satisfaction attributes of intercity bus passenger transport for passenger type cluster 1 (HSQP)? c. What is the cause effect relationship model which addresses the service quality dimensions, transportation and infrastructure, technology and satisfaction attributes of intercity bus passenger transport for passenger type cluster 2 (LSQP)? What is the cause effect relationship model which addresses the service quality dimensions, transportation and infrastructure, technology and satisfaction attributes of intercity bus passenger transport for passenger type cluster 3 (MSQP)?

Methodology

According to KSRTC key statistics (2015), on an average, 26.90 lakh passengers travel in Karnataka every day. A structured questionnaire captured passengers' perception on service quality of intercity bus passenger transport. Statistical techniques for data analysis involved Partial Least Square Structural Equation Modelling (PLS-SEM), mediation analysis, moderation analysis and multigroup analysis. Taking 26.90 lakh per day as the sample population, with 95% confidence level and 4% margin of error, the sample size for passenger questionnaire is 600 but in this study sample size is 605.

PLS-SEM Model Assessment

We used the PLS-SEM approach and assessed the measurement model (also referred to as the outer model) and structural model (also referred to as the inner model). Fig. 1 represents the structural model. SmartPLS (v.3.2.7) is used to perform PLS-SEM to achieve the above-mentioned objective. In PLS-SEM, assessment of the measurement model (also referred to as the outer model) includes composite reliability (CR) to evaluate internal consistency, individual indicator reliability and average variance extracted (AVE) to evaluate convergent validity (Hair et al., 2016). Internal consistency reliability is a form of reliability test that is used to assess the consistency of results across items of the same variables (Hair et al., 2013). It determines whether the items measuring a variable are similar in their scores (Hair et al., 2006). Internal consistency reliability is accessed by using composite reliability (CR). Convergent validity refers to the extent to which a measure correlates positively with alternative measures of the same variable (Hair et al., 2016). AVE was calculated to access convergent validity. Discriminant validity is the extent to which a variable is truly distinct from other variables, in terms of how much it correlates with other variables, and how much indicators represent only a single variable (Hair et al., 2016). The criterion and cross-loading scores of Fornell & Larcker (1981) were used to establish discriminant validity.

Technology mediation model

Fig. 1 depicts the PLS-SEM path model with service quality factors namely, service time reliability, information reliability, luggage assurance, tangibles, external tangibles, empathy, responsiveness, women friendliness, economic and environmental factors as exogenous variables. Overall satisfaction is considered as the endogenous variable. The technology factor is considered as mediating variable between service quality factors and overall satisfaction of intercity bus transport. The thickness of the paths between latent variables indicates the strength of significant impact on mediating and exogenous variables by endogenous variables. Table 1 shows the construct validity of the latent variables used in this section. CR values of all the latent variables used were found to be > 0.70 (Hair et al., 2006) which establishes internal consistency of the constructs. Table 1 shows the AVE values of the latent variables used in this section. These values were found to be more than the prescribed value of 0.50 (Hair et al., 2006) and therefore establish convergent validity.

Table 1. Construct Validity

Latent Variables	Composite Reliability	Average Variance Extracted (AVE)
Economic	0.891	0.673
Empathy (Emp)	0.842	0.642
Environmental (Env)	0.891	0.674
External tangibles (Etan)	0.879	0.786
Information reliability (Inf_Rel)	0.906	0.764
Luggage assurance (Lug_Ass)	0.851	0.656
Responsiveness (Resp)	0.852	0.591
Service time reliability (STR)	0.868	0.767
Overall satisfaction (satisfaction)	0.770	0.463
Tangibles (Tan)	0.852	0.657
Technology (Techno)	1.000	1.000
Women friendliness (Wm_fnd)	0.932	0.872

Table 2. Discriminant Validity – Fornell and Lacker Criterion

Latent variables	Eco	Emp	Env	Etan	Inf_Rel	Lug_Ass	Resp	STR	Satfn	Tan	Techno	Wm_fnd
Eco	0.820											
Emp	0.275	0.801										
Env	0.024	-0.034	0.821									
Etan	0.168	0.139	-0.101	0.887								
Inf_Rel	0.208	0.303	-0.099	0.278	0.874							
Lug_Ass	0.240	0.461	-0.099	0.182	0.327	0.810						
Resp	0.322	0.451	-0.011	0.213	0.288	0.328	0.769					
STR	0.172	0.376	0.014	0.133	0.103	0.243	0.165	0.876				
Satfn	0.264	0.524	-0.094	0.092	0.340	0.471	0.409	0.315	0.680			
Tan	0.204	0.456	-0.186	0.249	0.292	0.431	0.354	0.321	0.452	0.810		
Techno	0.034	0.068	-0.130	-0.020	0.197	0.172	0.210	0.014	0.257	0.105	1.000	
Wm_fnd	0.105	0.215	-0.014	0.092	0.059	0.093	0.134	0.075	0.151	0.168	-0.014	0.934

Notes: AVE: Average Variance Extracted; CR: Composite Reliability
The off-diagonal values are the correlations between latent variables and the diagonal are the square root of AVE.

Table 2. demonstrates the discriminant validity using Fornell and Lacker Criterion. The square root of AVE for all latent variables was higher than the inter-construct correlations (Fornell & Larcker, 1981) and therefore they confirm discriminant validity. Further, all indicators' individual loadings were found to be higher than their respective cross-loadings (Hair et al., 2013). Indicator reliability represents how much of the variation in an item is explained by a variable (Hair et al., 2013). Indicator reliability was assessed using the outer loadings as shown in Appendix. A higher outer loading on a variable indicates that the associated measure has much in common, that is measured by the variable (Hair et al., 2013). Hair, Hult, Ringle, & Sarstedt (2013) suggested that items having a loading >0.70 should be retained, items having an outer loading value >0.40 should be omitted and that its impact on the AVE and CR of the variable should be analyzed.

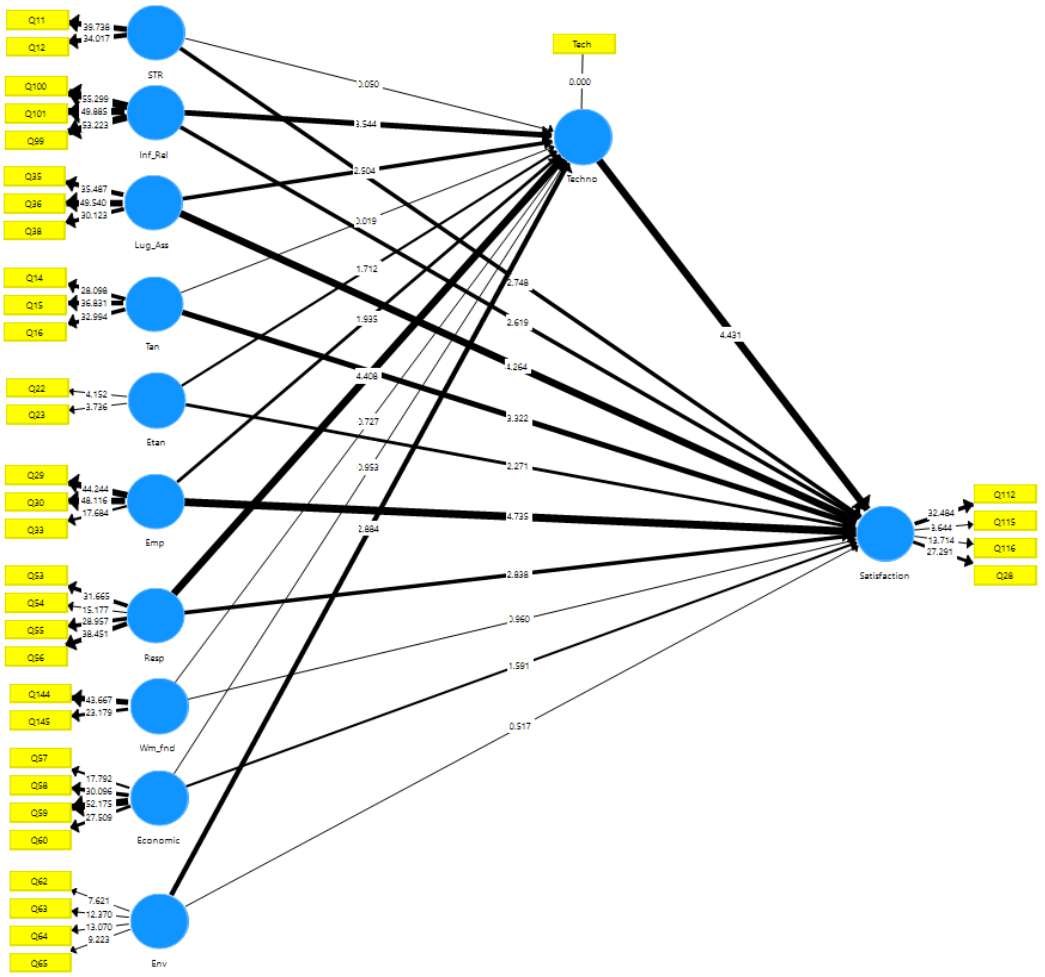

Fig. 1. Technology mediation model

Structural Model Assessment

After establishing the reliability and validity of the latent variables in the measurement model, the structural model (also referred to as the inner model) is assessed to test the relationship between endogenous and exogenous variables. In PLS-SEM, structural model assessment includes path coefficients to evaluate the significance and relevance of structural model relationships, R2 value to evaluate the model's predictive accuracy, Q2 to evaluate the model's predictive relevance and f2 to evaluate the substantial impact of the exogenous variable on an endogenous variable (Hair et al., 2013). Figures 7.4 shows the path coefficient for the direct relationship between service quality factors with the satisfaction and technology constructs. Nonparametric bootstrapping routine advocated by Vinzi et al., (2010), has been used on 605 data points and 1000 samples. "Bootstrapping is a re-sampling approach that draws random samples (with replacements) from the data and uses these samples to estimate the path model multiple times under slightly changed data constellations" (Hair et al., 2013, p. 162). The main purpose of bootstrapping is to calculate the standard error of coefficient estimates to examine the coefficient's statistical significance (Vinzi et al., 2010).

Table 3. Results of Structural Relationship

Path	Path Coefficient	Standard Deviation	T Statistics	P Values	Decision
Economic -> Satisfaction	0.058	0.037	1.591	0.112	Not supported
Economic -> Techno	-0.042	0.044	0.953	0.341	Not supported
Emp -> Satisfaction	0.231	0.049	4.735	0.000**	Supported
Emp -> Techno	-0.101	0.052	1.935	0.053	Not supported
Env -> Satisfaction	-0.021	0.041	0.517	0.605	Not supported
Env -> Techno	-0.115	0.040	2.884	0.004**	Supported
Etan -> Satisfaction	-0.089	0.039	2.271	0.023*	Supported
Etan -> Techno	-0.119	0.070	1.712	0.087	Not supported
Inf_Rel -> Satisfaction	0.106	0.040	2.619	0.009**	Supported
Inf_Rel -> Techno	0.159	0.045	3.544	0.000**	Supported
Lug_Ass -> Satisfaction	0.174	0.041	4.264	0.000**	Supported
Lug_Ass -> Techno	0.121	0.048	2.504	0.012*	Supported
Resp -> Satisfaction	0.111	0.039	2.838	0.005**	Supported
Resp -> Techno	0.212	0.048	4.408	0.000**	Supported
STR -> Satisfaction	0.105	0.038	2.748	0.006**	Supported
STR -> Techno	-0.002	0.045	0.050	0.960	Not supported
Tan -> Satisfaction	0.154	0.046	3.322	0.001**	Supported
Tan -> Techno	-0.001	0.050	0.019	0.985	Not supported
Techno -> Satisfaction	0.144	0.032	4.431	0.000**	Supported
Wm_fnd -> Satisfaction	0.034	0.035	0.960	0.337	Not supported
Wm_fnd -> Techno	-0.027	0.037	0.727	0.467	Not supported

** $p < 0.01$, * $p < 0.05$

Assessing F^2, R^2 and Q^2 value

F^2 size effect is the measure to evaluate the change in R^2 value when a specified exogenous variable is omitted from the model. F^2 size effect shows the impact of a specific predictor latent variable on a specific endogenous variable as shown in table 4. In this study, F^2 size effect is small for all the exogenous variables in explaining the overall satisfaction and technology.

Table 4. Results of F^2

Endogenous Latent Variables	Satisfaction			Technology		
Exogenous Latent Variables	Path Coefficients	F^2 Effect Size	Effect	Path Coefficients	F^2 Effect Size	Effect
Economic	0.058	0.005	Small	-0.042	0.002	Small
Emp	0.231	0.054	Small	-0.101	0.007	Small
Env	-0.021	0.001	Small	-0.115	0.014	Small
Etan	-0.089	0.012	Small	-0.119	0.014	Small
Inf_Rel	0.106	0.015	Small	0.159	0.022	Small
Lug_Ass	0.174	0.037	Small	0.121	0.011	Small

Resp	0.111	0.015	Small	0.212	0.036	Small
STR	0.105	0.016	Small	-0.002	0.000	Small
Tan	0.154	0.027	Small	-0.001	0.000	Small
Techno	0.144	0.033	Small			
Wm_fnd	0.034	0.002	Small	-0.027	0.001	Small

Small: $0.0 < F^2$ effect size < 0.15; Medium: $0.15 < F^2$ effect size < 0.35; Large: F^2 effect size > 0.35

R^2 (Coefficient of determination) value is used to evaluate the structural model. This coefficient measures the predictive accuracy of the model and is calculated as the squared correlation between actual and predictive values of a specified endogenous construct. In our study, the endogenous variables namely satisfaction and technology have R^2 values 0.438 and 0.106 respectively. This reflects the fact the structural model developed in this study has predictive relevance. Further the examination of the endogenous variables' predictive power has medium and small R^2 values respectively (refer table 8.5).

Table 5. Results of R^2 and Q^2

Endogenous Latent Variable	R^2	Adjusted R^2	Q^2	Effect Size[a]
Satisfaction	0.438	0.427	0.182	Medium
Technology	0.106	0.091	0.061	Small

a. Small: $0.0 < Q^2$ effect size < 0.15; Medium: $0.15 < Q^2$ effect size < 0.35; Large: Q^2 effect size > 0.35

Q^2 values of 0 and below indicates a lack of predictive relevance (Hair et al., 2017).

Blindfolding was used to cross-validate the model's predictive relevance for each of the individual endogenous variables, the Stone-Geisser Q2 value (Geisser, 1974; Stone, 1974). By performing the blindfolding technique (Hair et al., 2013) with an omission distance of 8 yielded cross-validated redundancy Q2 values of all the endogenous variables. In this study, overall satisfaction has a Q2 value of 0.182 and technology has 0.061 respectively. This shows medium and small effect sizes, respectively. Because all the Q2 values are >0, it establishes the fact that the PLS structural model has predictive relevance.

In this study, mediation analysis was carried out to estimate the magnitude of indirect effect of mediating variable namely technology on the relationship between exogenous variables namely service time reliability, information reliability, luggage assurance, tangibles, external tangibles, empathy, responsiveness, economic and environment and endogenous variable namely overall satisfaction. From table 7.7, VAF values clearly indicates that technology mediate the relationship between exogenous variables namely environment and responsiveness variables with overall satisfaction. The mediation effect is complementary partial. Whereas the technology does not mediate the relationship between exogenous variables namely economic, empathy, external tangibles, information reliability, luggage assurance, service time reliability, tangibles and women friendliness with overall satisfaction.

Table 6. Mediation Analysis: Technology as Mediator

Factors	P13 (Direct effect)	Indirect Effect	Total Effect	VAF	Mediation
Economic	0.058	-0.006	-0.006	-0.117	No
Emp	0.231	-0.015	-0.015	-0.067	No
Env	-0.021	-0.017	-0.017	0.439	Complementary Partial
Etan	-0.089	-0.017	-0.017	0.162	No
Inf_Rel	0.106	0.023	0.023	0.178	No

Lug_Ass	0.174	0.017	0.017	0.091	No
Resp	0.111	0.031	0.031	0.216	Complementary Partial
STR	0.105	0.000	0.000	-0.003	No
Tan	0.154	0.000	0.000	-0.001	No
Wm_fnd	0.034	-0.004	-0.004	-0.130	No

Mediating Variable: Technology; Endogenous Variable: overall satisfaction
i) If 0 < VAF < 0.20, then No Mediation.
ii) If 0.20 < VAF < 0.80, then Partial Mediation.
iii) If VAF > 0.80, then Full Mediation.
if VAF is positive = Complementary Partial Mediation
if VAF is negative = Competitive partial mediation

Partial Least Square Multi Group Analysis (PLS-MGA)

PLS-MGA refers to a set of different techniques that have been developed for comparing PLS-SEM model estimates across two or more groups of data. Usually, PLS-MGA is used to explore differences between path coefficients in the structural model, but one can also compare, for example, loadings or weights (Hair et al., 2017). In our study, since there are three passenger clusters, PLS-MGA technique is employed to compare the estimates across all the three passenger clusters.

Table 7. Partial Least Square Multi Group Analysis of passenger clusters

Path	Path Coefficients-diff (Clus1 -Clus2)	Path Coefficients-diff (Clus1 -Clus3)	Path Coefficients-diff (Clus2 - Clus3)	p-Value (Clus1 vs Clus2)	p-Value (Clus1 vs Clus3)	p-Value (Clus2 vs Clus3)
Economic -> Satisfaction	0.156	0.071	0.086	0.110	0.330	0.688
Economic -> Techno	0.087	0.016	0.102	0.228	0.556	0.797
Emp -> Satisfaction	0.018	0.156	0.138	0.563	0.857	0.831
Emp -> Techno	0.055	0.187	0.242	0.309	0.936	0.963
Env -> Satisfaction	0.247	0.162	0.410	0.995	0.073	0.003**
Env -> Techno	0.383	0.090	0.293	1.000	0.825	0.003**
Etan -> Satisfaction	0.261	0.186	0.075	0.002**	0.083	0.730
Etan -> Techno	0.307	0.307	0.000	0.999	0.998	0.503
Inf_Rel -> Satisfaction	0.097	0.031	0.128	0.147	0.597	0.757
Inf_Rel -> Techno	0.279	0.171	0.449	0.008**	0.958	1.000
Lug_Ass -> Satisfaction	0.169	0.178	0.009	0.031	0.074	0.469
Lug_Ass -> Techno	0.008	0.116	0.107	0.530	0.864	0.823
Resp -> Satisfaction	0.090	0.305	0.394	0.829	0.016*	0.003**
Resp -> Techno	0.354	0.041	0.395	0.009**	0.634	0.995
STR -> Satisfaction	0.069	0.203	0.134	0.242	0.068	0.147
STR -> Techno	0.141	0.282	0.142	0.107	0.017*	0.105
Tan -> Satisfaction	0.013	0.039	0.026	0.560	0.631	0.594
Tan -> Techno	0.056	0.045	0.101	0.685	0.353	0.186
Techno -> Satisfaction	0.023	0.027	0.004	0.619	0.601	0.525
Wm_fnd -> Satisfaction	0.007	0.079	0.085	0.471	0.774	0.799
Wm_fnd -> Techno	0.054	0.109	0.056	0.258	0.123	0.285

** p < 0.01, * p < 0.05

The findings of the PLS-MGA presented in the table 7 indicates that there is a significant difference between the passenger cluster1 and passenger cluster 2 with respect to the effect of external tangibles to overall satisfaction, the effect of information reliability and responsiveness to the technology dimension of the intercity bus transport. There is a significant difference between the passenger cluster1 and passenger cluster 3 with respect to the effect of responsiveness to the overall satisfaction of the intercity bus transport and the effect of service time reliability to technology dimension. There is a significant difference between the passenger cluster2 and passenger cluster 3 with respect to the effect of environment and responsiveness to the overall satisfaction of the intercity bus transport and the effect of environment to technology dimension.

Table 8. Path coefficient of passenger clusters

Path	t-Values (Clus1)	t-Values (Clus2)	t-Values (Clus3)	p-Values (Clus1)	p-Values (Clus2)	p-Values (Clus3)
Economic -> Satisfaction	1.537	0.454	0.293	0.125	0.650	0.769
Economic -> Techno	0.298	1.300	0.104	0.766	0.194	0.917
Emp -> Satisfaction	1.645	1.976	2.308	0.100	0.048*	0.021*
Emp -> Techno	1.696	1.923	0.723	0.090	0.055	0.470
Env -> Satisfaction	1.582	2.163	2.708	0.114	0.031*	0.007**
Env -> Techno	3.033	2.380	1.660	0.002**	0.017*	0.097
Etan -> Satisfaction	1.009	3.506	1.031	0.313	0.000**	0.303
Etan -> Techno	5.049	0.193	0.163	0.000**	0.847	0.871
Inf_Rel -> Satisfaction	2.842	0.822	1.128	0.005**	0.411	0.260
Inf_Rel -> Techno	1.966	1.768	4.352	0.050*	0.077	0.000**
Lug_Ass -> Satisfaction	4.294	2.033	1.093	0.000**	0.042*	0.275
Lug_Ass -> Techno	0.064	0.158	1.395	0.949	0.875	0.163
Resp -> Satisfaction	2.037	3.626	1.309	0.042*	0.000**	0.191
Resp -> Techno	4.199	0.515	3.583	0.000**	0.607	0.000**
STR -> Satisfaction	2.185	1.466	0.335	0.029*	0.143	0.738
STR -> Techno	1.628	0.061	1.726	0.104	0.951	0.085
Tan -> Satisfaction	1.682	2.095	1.379	0.093	0.036*	0.168
Tan -> Techno	0.192	0.525	0.714	0.848	0.600	0.475
Techno -> Satisfaction	2.519	3.011	1.565	0.012*	0.003**	0.118
Wm_fnd -> Satisfaction	0.815	0.773	1.663	0.415	0.439	0.097
Wm_fnd -> Techno	0.902	0.038	0.762	0.367	0.969	0.446

** p < 0.01, * p < 0.05

The table 8 indicates the path coefficients and significance of paths between endogenous and exogenous constructs in multi group analysis. The path between environment and technology, external tangibles and technology, information reliability and satisfaction, information reliability and technology, luggage assurance and satisfaction, responsiveness and satisfaction, responsiveness and technology, service time reliability and satisfaction, technology and satisfaction are significant in the passenger cluster1. The path between empathy and satisfaction, environment and satisfaction, environment and technology, external tangibles and satisfaction, luggage assurance and satisfaction, responsiveness and satisfaction, tangibles and satisfaction, technology and satisfaction are significant in the passenger cluster2. The path between empathy and satisfaction, environment and satisfaction, information reliability and technology, responsiveness and technology are significant in the passenger cluster3.

Model Fit

Table 9 represents the model fit summary. The SRMR and NFI value of the model is 0.064 and 0.651 respectively. Since SRMR value is less than 0.08, model is considered good fit whereas NFI value is not closer to 1. By considering the Q2 value, the model has medium predictive relevance.

Table 9. Model fit summary

Fit Summary	Saturated Model	Estimated Model
SRMR	0.064	0.064
d_ULS	2.551	2.551
d_G1	1.107	1.107
d_G2	0.830	0.830
Chi-Square	3,099.604	3,099.604
NFI	0.651	0.651

Discussion

According to findings of the study presented in the table 3, empathy, information reliability, luggage assurance, responsiveness, service time reliability, tangibles factors of service quality and technology factor is positively associated with and have significant impact on overall satisfaction of intercity bus transport. Whereas external tangible is negatively associated with overall satisfaction and have significant impact on it. The service quality factors namely, information reliability, luggage assurance and responsiveness are positively associated with mediating variable namely technology and have significant relationship. Whereas environment is negatively associated and have significant relationship with mediating variable namely, technology. Hence, it is very important for intercity bus passenger transportation to give importance on empathy, information reliability, luggage assurance, responsiveness, service time reliability and tangibles dimensions of service quality and practice it, because it has a direct and positive impact on overall satisfaction of transport service. Also, information reliability, luggage assurance and responsiveness are important for technology dimension, because technology is not a standalone entity and call for the joint efforts of service providers to ensure better service quality.

The factors such as economic, environment and women friendliness do not have significant relationship with overall satisfaction of intercity transport. Also, factors such as economic, empathy, external tangible, service time reliability, tangibles and women friendliness do not have significant relationship with technology dimension of intercity bus transport.

Fig. 2 depicts the PLS-SEM path model with service quality factors namely, service time reliability, information reliability, luggage assurance, tangibles, external tangibles, empathy, responsiveness, women friendliness, economic and environmental factors as exogenous variables. Overall satisfaction is considered as the endogenous variable. The technology factor is considered as mediating variable between service quality factors and overall satisfaction, policy and road infrastructure variables as moderators of intercity bus transport. Moderator effect occurs when the effect of an exogenous latent variable on an endogenous latent variable depends on the values of another variable that moderates the relationship (Hair et al., 2017). The thickness of the paths between latent variables indicates the strength of significant impact between exogenous, mediating, moderating and endogenous constructs. The moderation effect of policy on overall satisfaction with respect to empathy, tangibles, economic and environmental constructs are considered. The moderation effect of road infrastructure on overall satisfaction with respect to empathy, tangibles and economic constructs are considered. This is because other constructs do not fit into the model as per the CR and AVE requirements.

Structural Model Assessment: Path-Coefficients of HSQP cluster

Fig. 2 shows the path coefficient for the direct relationship between service quality factors with the satisfaction and technology constructs. Nonparametric bootstrapping routine advocated by Vinzi et al., (2010), has been used on 225 data points and 1000 samples. “Bootstrapping is a re-sampling approach that draws random samples (with

replacements) from the data and uses these samples to estimate the path model multiple times under slightly changed data constellations" (Hair et al., 2013, p. 162).

High Service Quality Perception (HSQP) Cluster

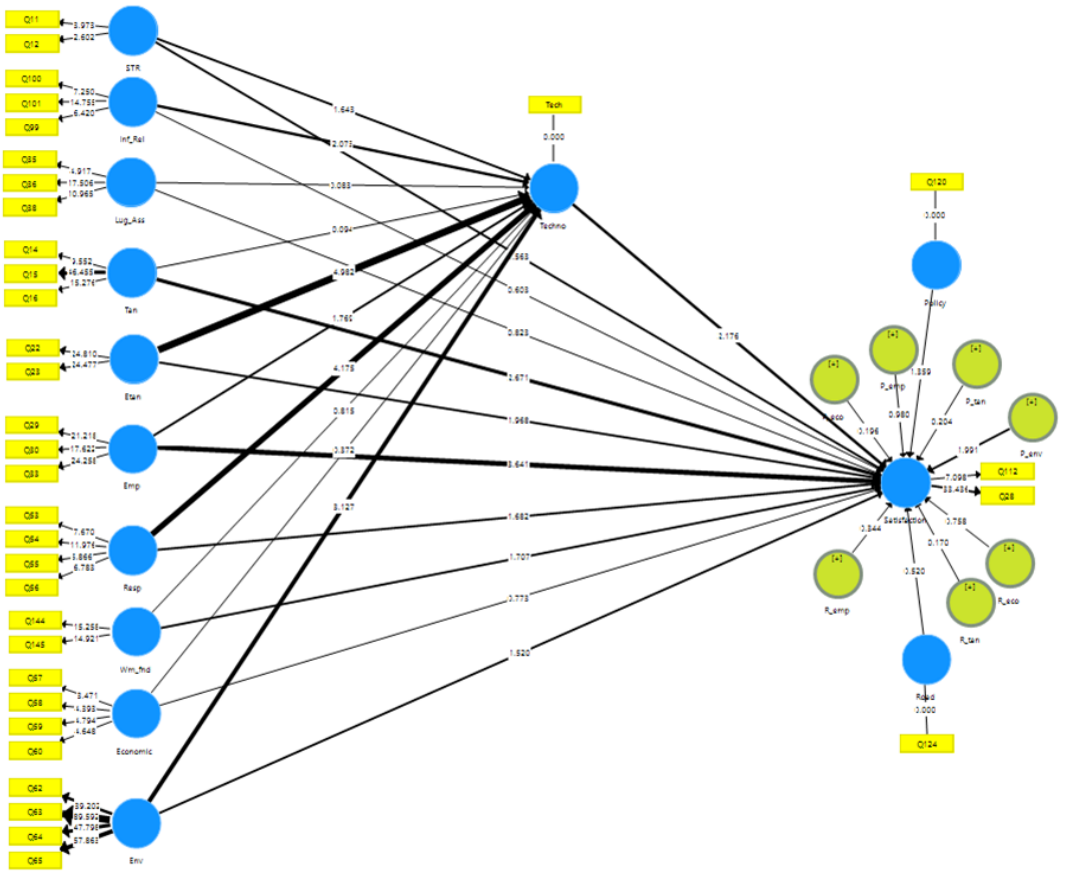

Fig. 2. High Service Quality Preference Cluster

Table 10. Results of Structural Relationship

Path	Path Coefficient	Standard Deviation	T Statistics	P Values	Decision
Economic -> Satisfaction	0.178	0.231	0.773	0.440	Not supported
Economic -> Techno	-0.027	0.073	0.372	0.710	Not supported
Emp -> Satisfaction	0.271	0.075	3.641	0.000**	Supported
Emp -> Techno	-0.120	0.068	1.769	0.077	Not supported
Env -> Satisfaction	0.417	0.275	1.520	0.129	Not supported
Env -> Techno	-0.200	0.064	3.127	0.002**	Supported
Etan -> Satisfaction	0.152	0.077	1.968	0.049*	Supported
Etan -> Techno	-0.289	0.058	4.982	0.000**	Supported
Inf_Rel -> Satisfaction	0.045	0.075	0.603	0.547	Not supported
Inf_Rel -> Techno	0.152	0.073	2.073	0.038*	Supported

Lug_Ass -> Satisfaction	0.059	0.072	0.823	0.411	Not supported
Lug_Ass -> Techno	0.005	0.065	0.083	0.934	Not supported
P_eco -> Satisfaction	-0.054	0.275	0.196	0.845	Not supported
P_emp -> Satisfaction	0.079	0.081	0.980	0.327	Not supported
P_env -> Satisfaction	-0.503	0.252	1.991	0.047*	Supported
P_tan -> Satisfaction	-0.016	0.080	0.204	0.838	Not supported
Policy -> Satisfaction	0.706	0.520	1.359	0.175	Not supported
R_eco -> Satisfaction	0.106	0.140	0.758	0.449	Not supported
R_emp -> Satisfaction	0.024	0.070	0.344	0.731	Not supported
R_tan -> Satisfaction	0.014	0.080	0.170	0.865	Not supported
Resp -> Satisfaction	0.124	0.074	1.682	0.093	Not supported
Resp -> Techno	0.291	0.070	4.175	0.000**	Supported
Road -> Satisfaction	-0.140	0.269	0.520	0.604	Not supported
STR -> Satisfaction	0.118	0.076	1.563	0.118	Not supported
STR -> Techno	0.132	0.081	1.643	0.101	Not supported
Tan -> Satisfaction	0.198	0.074	2.671	0.008**	Supported
Tan -> Techno	-0.008	0.083	0.094	0.925	Not supported
Techno -> Satisfaction	0.155	0.071	2.176	0.030*	Supported
Wm_fnd -> Satisfaction	0.142	0.083	1.707	0.088	Not supported
Wm_fnd -> Techno	0.047	0.058	0.815	0.415	Not supported

** $p < 0.01$, * $p < 0.05$

The main purpose of bootstrapping is to calculate the standard error of coefficient estimates to examine the coefficient's statistical significance (Vinzi et al., 2010).

HSQP cluster Mediation Analysis

From Table 11, VAF values clearly indicates that technology mediate the relationship between exogenous variables namely external tangibles, information reliability and responsiveness constructs with overall satisfaction. The mediation effect is complementary partial for information reliability and responsiveness, the effect is competitive partial for external tangibles. Whereas the technology does not mediate the relationship between exogenous constructs namely economic, empathy, environmental, luggage assurance, service time reliability, tangibles and women friendliness with overall satisfaction.

Table 11. Mediation Analysis: Technology as Mediator

Factors	P13 (Direct effect)	Indirect Effect	Total Effect	VAF	Mediation
Economic	0.178	-0.004	0.174	-0.024	No
Emp	0.271	-0.019	0.253	-0.074	No
Env	0.417	-0.031	0.386	-0.080	No
Etan	0.152	-0.045	0.108	-0.417	Competitive Partial
Inf_Rel	0.045	0.024	0.069	0.341	Complementary Partial
Lug_Ass	0.059	0.001	0.060	0.014	No
Resp	0.124	0.045	0.169	0.267	Complementary Partial

STR	0.118	0.021	-0.140	0.148	No
Tan	0.198	-0.001	0.138	-0.006	No
Wm_fnd	0.142	0.007	0.197	0.049	No

Mediating Variable: Technology; Endogenous Variable: overall satisfaction
i) If 0 < VAF < 0.20, then No Mediation.
ii) If 0.20 < VAF < 0.80, then Partial Mediation.
iii) If VAF > 0.80, then Full Mediation.
if VAF is positive = Complementary Partial Mediation
if VAF is negative = Competitive partial mediation

Discussion

According to findings of the study presented in the table 10, empathy, external tangibles, tangibles and technology constructs are positively associated with overall satisfaction of intercity bus transport and have significant impact on it. Policy to environment moderation, is negatively associated with overall satisfaction and have significant impact on it. The information reliability and responsiveness constructs are positively associated with mediating variable namely technology and have significant relationship. Whereas environmental, tangibles and external tangibles constructs are negatively associated with mediating variable namely, technology and have a significant relationship. Hence, it is very important for intercity bus passenger transportation to give importance on empathy, external tangibles, tangibles and technology dimensions of service quality and practice it, because it has a direct and positive impact on overall satisfaction of transport service. Also, information reliability and responsiveness dimensions are important for technology dimension, because technology is not a standalone entity and call for the joint efforts of service providers to ensure better service quality.

Low Service Quality Preference (LSQP) Cluster

Fig. 3 depicts the PLS-SEM path model with service quality factors namely, service time reliability, information reliability, luggage assurance, tangibles, external tangibles, empathy, responsiveness, women friendliness, economic and environmental factors as exogenous variables. Overall satisfaction is considered as the endogenous variable. The technology factor is considered as mediating variable between service quality factors and overall satisfaction, policy and road infrastructure variables as moderators of intercity bus transport. Moderator effect occurs when the effect of an exogenous latent variable on an endogenous latent variable depends on the values of another variable that moderates the relationship (Hair et al., 2017). The thickness of the paths between latent variables indicates the strength of significant impact between exogenous, mediating, moderating and endogenous constructs. The moderation effect of policy on overall satisfaction with respect to empathy, tangibles, economic and environmental constructs are considered. The moderation effect of road infrastructure on overall satisfaction with respect to empathy, tangibles and economic constructs are considered. This is because other constructs do not fit into the model as per the CR and AVE requirements.

Structural Model Assessment: Path-Coefficients of LSQP cluster

Fig. 3 shows the path coefficient for the direct relationship between service quality factors with the satisfaction and technology constructs. Nonparametric bootstrapping routine advocated by Vinzi et al., (2010), has been used on 238 data points and 1000 samples. “Bootstrapping is a re-sampling approach that draws random samples (with replacements) from the data and uses these samples to estimate the path model multiple times under slightly changed data constellations” (Hair et al., 2016). The main purpose of bootstrapping is to calculate the standard error of coefficient estimates to examine the coefficient’s statistical significance (Vinzi et al., 2010).

Table 12. Results of Structural Relationship

Path	Path Coefficient	Standard Deviation	T Statistics	P Values	Decision
Economic -> Satisfaction	-0.260	0.147	1.776	0.076	Not supported

Economic -> Techno	-0.108	0.075	1.437	0.151	Not supported
Emp -> Satisfaction	0.153	0.074	2.057	0.040*	Supported
Emp -> Techno	-0.151	0.088	1.716	0.087	Not supported
Env -> Satisfaction	0.069	0.149	0.464	0.643	Not supported
Env -> Techno	0.179	0.074	2.415	0.016*	Supported
Etan -> Satisfaction	-0.120	0.055	2.188	0.029*	Supported
Etan -> Techno	0.023	0.075	0.298	0.765	Not supported
Inf_Rel -> Satisfaction	0.043	0.086	0.502	0.616	Not supported
Inf_Rel -> Techno	-0.131	0.077	1.696	0.090	Not supported
Lug_Ass -> Satisfaction	0.138	0.059	2.330	0.020*	Supported
Lug_Ass -> Techno	0.020	0.079	0.255	0.799	Not supported
P_eco -> Satisfaction	-0.199	0.178	1.116	0.264	Not supported
P_emp -> Satisfaction	0.093	0.081	1.139	0.255	Not supported
P_env -> Satisfaction	-0.050	0.335	0.148	0.882	Not supported
P_tan -> Satisfaction	0.031	0.083	0.370	0.711	Not supported
Policy -> Satisfaction	0.308	0.468	0.658	0.511	Not supported
R_eco -> Satisfaction	0.288	0.163	1.771	0.077	Not supported
R_emp -> Satisfaction	-0.107	0.077	1.392	0.164	Not supported
R_env -> Satisfaction	0.056	0.196	0.286	0.775	Not supported
R_tan -> Satisfaction	0.022	0.081	0.266	0.790	Not supported
Resp -> Satisfaction	0.294	0.074	3.985	0.000**	Supported
Resp -> Techno	-0.100	0.095	1.054	0.292	Not supported
Road -> Satisfaction	-0.339	0.294	1.151	0.250	Not supported
STR -> Satisfaction	0.111	0.070	1.571	0.117	Not supported
STR -> Techno	-0.005	0.075	0.071	0.943	Not supported
Tan -> Satisfaction	0.105	0.066	1.607	0.108	Not supported
Tan -> Techno	0.041	0.075	0.543	0.587	Not supported
Techno -> Satisfaction	0.118	0.056	2.118	0.034*	supported
Wm_fnd -> Satisfaction	0.016	0.071	0.229	0.819	Not supported
Wm_fnd -> Techno	-0.009	0.060	0.147	0.883	Not supported

** $p < 0.01$, * $p < 0.05$

LSQP cluster mediation analysis

From table 13, VAF values clearly indicates that technology mediate the relationship between exogenous variables namely information reliability and environmental constructs with overall satisfaction. The mediation effect is complementary partial for environmental, the effect is competitive partial for information reliability. Whereas the technology does not mediate the relationship between exogenous constructs namely economic, empathy, external tangibles, luggage assurance, responsiveness, service time reliability, tangibles and women friendliness with overall satisfaction.

Table 13. Mediation Analysis: Technology as Mediator

Factors	P13 (Direct effect)	Indirect Effect	Total Effect	VAF	Mediation
Economic	-0.260	-0.013	-0.273	0.047	No
Emp	0.153	-0.018	0.135	-0.132	No
Env	0.069	0.021	0.090	0.234	Complementary Partial
Etan	-0.120	0.003	-0.118	-0.023	No
Inf_Rel	0.043	-0.015	0.028	-0.557	Competitive Partial
Lug_Ass	0.138	0.002	0.140	0.017	No
Resp	0.294	-0.012	0.283	-0.042	No
STR	0.111	-0.001	-0.339	-0.006	No
Tan	0.105	0.005	0.110	0.044	No
Wm_fnd	0.016	-0.001	0.110	-0.069	No

Mediating Variable: Technology; Endogenous Variable: Satisfaction
i) If 0 < VAF < 0.20, then No Mediation.
ii) If 0.20 < VAF < 0.80, then Partial Mediation.
iii) If VAF > 0.80, then Full Mediation.
if VAF is positive = Complementary Partial Mediation
if VAF is negative = Competitive partial mediation

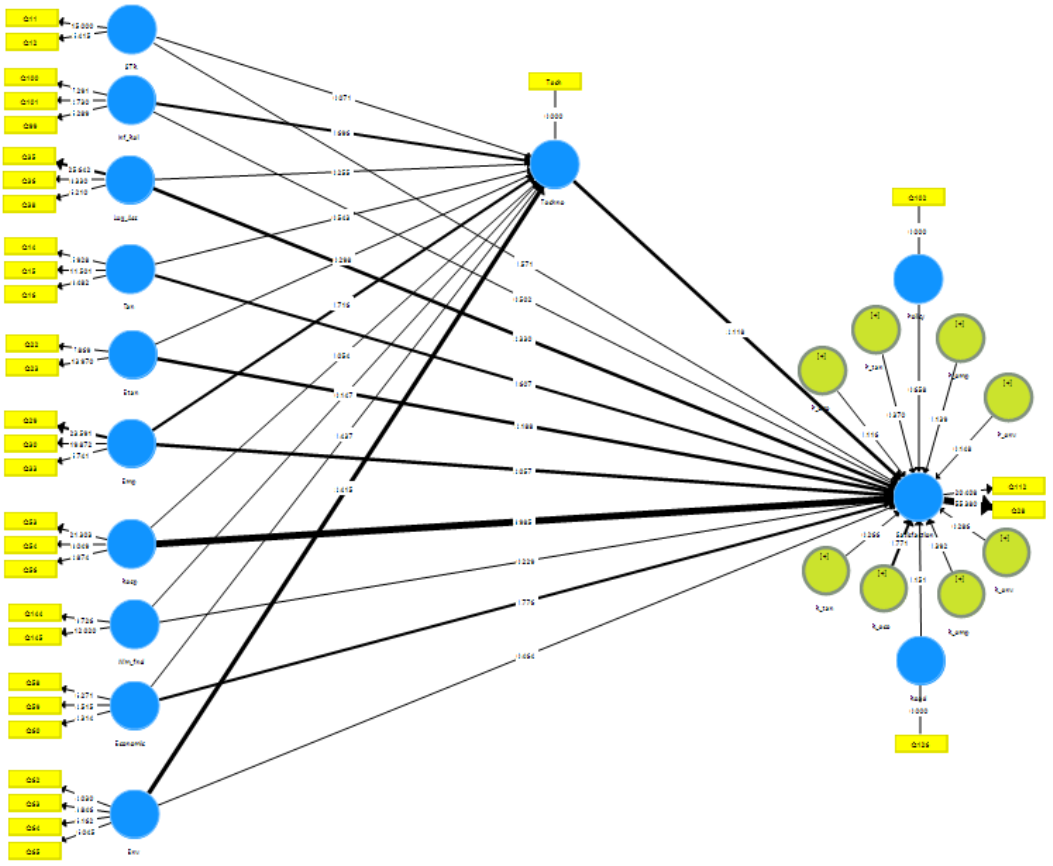

Fig. 3. Low service quality preference cluster

Discussion

According to findings of the study presented in table 12, the empathy, external tangibles, tangibles, luggage assurance and responsiveness constructs are positively associated with overall satisfaction of intercity bus transport and have significant impact on it. The environmental construct is positively associated with mediating construct that is, technology and have significant relationship. Hence, it is very important for intercity bus passenger transportation to give importance on empathy, external tangibles, tangibles, luggage assurance and responsiveness dimensions of service quality and practice it, because it has a direct and positive impact on overall satisfaction of transport service. Also, environmental dimension is important for technology dimension, because technology is not a standalone entity and call for the joint efforts of service providers to ensure better service quality.

Moderate Service Quality Preference (MSQP) Cluster

Fig. 4 depicts the PLS-SEM path model with service quality factors namely, service time reliability, information reliability, luggage assurance, tangibles, external tangibles, empathy, responsiveness, women friendliness, economic and environmental factors as exogenous variables. Overall satisfaction is considered as the endogenous variable. The technology factor is considered as mediating variable between service quality factors and overall satisfaction, policy and road infrastructure variables as moderators of intercity bus transport. Moderator effect occurs when the effect of an exogenous latent variable on an endogenous latent variable depends on the values of another variable that moderates the relationship (Hair et al., 2017). The thickness of the paths between latent variables indicates the strength of significant impact between exogenous, mediating, moderating and endogenous constructs. The moderation effect of policy on overall satisfaction with respect to tangibles, economic and environmental constructs are considered. The moderation effect of road infrastructure on overall satisfaction with respect to empathy, environmental and economic constructs are considered. This is because other constructs do not fit into the model as per the CR and AVE requirements.

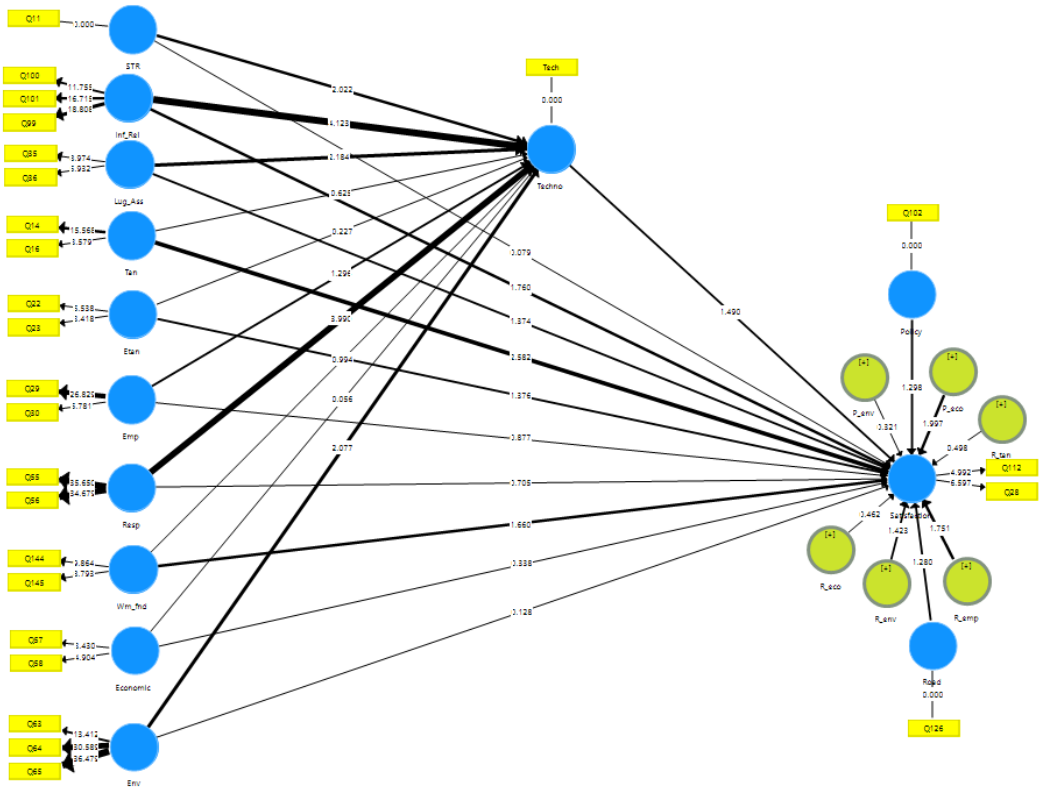

Fig. 4. Moderate Service Quality Preference (MSQP) Cluster

Structural Model Assessment: Path-Coefficients of MSQP cluster

Fig. 4 shows the path coefficient for the direct relationship between service quality factors with the satisfaction and technology constructs. Nonparametric bootstrapping routine advocated by Vinzi et al., (2010), has been used on 142 data points and 1000 samples. "Bootstrapping is a re-sampling approach that draws random samples (with replacements) from the data and uses these samples to estimate the path model multiple times under slightly changed data constellations" (Hair et al., 2016). The main purpose of bootstrapping is to calculate the standard error of coefficient estimates to examine the coefficient's statistical significance (Vinzi et al., 2010).

Table 14. Results of Structural Relationship

Path	Path Coefficients	Standard Deviation	T Statistics	P Values	Decision
Economic -> Satisfaction	0.087	0.251	0.349	0.727	Not supported
Economic -> Techno	0.004	0.077	0.055	0.956	Not supported
Emp -> Satisfaction	-0.253	0.297	0.852	0.395	Not supported
Emp -> Techno	0.109	0.084	1.289	0.198	Not supported
Env -> Satisfaction	0.024	0.186	0.131	0.896	Not supported
Env -> Techno	-0.144	0.070	2.065	0.039*	Supported
Etan -> Satisfaction	-0.140	0.100	1.400	0.162	Not supported
Etan -> Techno	0.018	0.084	0.219	0.827	Not supported
Inf_Rel -> Satisfaction	0.231	0.136	1.704	0.089	Not supported
Inf_Rel -> Techno	0.318	0.079	4.003	0.000**	Supported
Lug_Ass -> Satisfaction	0.126	0.093	1.364	0.173	Not supported
Lug_Ass -> Techno	0.162	0.074	2.186	0.029*	Supported
P_eco -> Satisfaction	-0.528	0.239	2.211	0.027*	Supported
P_env -> Satisfaction	0.073	0.229	0.317	0.751	Not supported
Policy -> Satisfaction	0.484	0.363	1.332	0.183	Not supported
R_eco -> Satisfaction	0.103	0.224	0.460	0.646	Not supported
R_emp -> Satisfaction	0.833	0.478	1.743	0.082	Not supported
R_env -> Satisfaction	-0.328	0.230	1.424	0.155	Not supported
R_tan -> Satisfaction	0.058	0.110	0.528	0.597	Not supported
Resp -> Satisfaction	-0.068	0.097	0.700	0.484	Not supported
Resp -> Techno	0.314	0.077	4.087	0.000**	Supported
Road -> Satisfaction	-0.932	0.747	1.248	0.212	Not supported
STR -> Satisfaction	0.006	0.077	0.080	0.936	Not supported
STR -> Techno	-0.144	0.072	2.007	0.045*	Supported
Tan -> Satisfaction	0.225	0.089	2.536	0.011*	Supported
Tan -> Techno	-0.047	0.082	0.579	0.563	Not supported
Techno -> Satisfaction	0.156	0.100	1.560	0.119	Not supported
Wm_fnd -> Satisfaction	0.122	0.068	1.801	0.072	Not supported
Wm_fnd -> Techno	-0.077	0.079	0.967	0.334	Not supported

** $p < 0.01$, * $p < 0.05$

MSQP cluster mediation analysis

From table 15, VAF values clearly indicates that technology construct mediates the relationship between exogenous constructs that is, environmental, responsiveness and service time reliability with overall satisfaction. The mediation effect is full for environmental, responsiveness and service time reliability constructs. Whereas the technology does not mediate the relationship between exogenous constructs namely economic, empathy, external tangibles, information reliability, luggage assurance, tangibles and women friendliness with overall satisfaction.

Table 15. Mediation Analysis: Technology as Mediator

Factors	P13 (Direct effect)	Indirect Effect	Total Effect	VAF	Mediation
Economic	0.087	0.001	0.088	0.007	No
Emp	-0.253	0.017	-0.236	-0.072	No
Env	0.024	-0.022	0.002	-11.506	Full Mediation
Etan	-0.140	0.003	-0.137	-0.021	No
Inf_Rel	0.231	0.050	0.281	0.177	No
Lug_Ass	0.126	0.025	0.152	0.166	No
Resp	-0.068	0.049	-0.019	-2.546	Full Mediation
STR	0.006	-0.023	-0.932	1.381	Full Mediation
Tan	0.225	-0.007	-0.016	-0.034	No
Wm_fnd	0.122	-0.012	0.218	-0.109	No

Mediating Variable: Technology; Endogenous Variable: Satisfaction

i) If $0 < VAF < 0.20$, then No Mediation.

ii) If $0.20 < VAF < 0.80$, then Partial Mediation.

iii) If $VAF > 0.80$, then Full Mediation.

if VAF is positive = Complementary Partial Mediation

if VAF is negative = Competitive partial mediation

Discussion

According to findings of the study presented in table 20, tangibles construct is positively associated with overall satisfaction of intercity bus transport and have significant impact on it. Whereas policy to economic moderation, is negatively associated with overall satisfaction and have significant impact on it. The luggage assurance and responsiveness constructs are positively associated with mediating variable namely technology and have significant relationship. Whereas environmental construct is negatively associated with mediating variable that is, technology and have a significant relationship. Hence, it is very important for intercity bus passenger transportation to give importance on tangibles dimensions of service quality and practice it, because it has a direct and positive impact on overall satisfaction of transport service. Also, luggage assurance and responsiveness dimensions are important for technology dimension, because technology is not a standalone entity and call for the joint efforts of service providers to ensure better service quality.

Conclusion

This study attempted to build relationship model of service quality in relation with overall satisfaction of intercity bus transportation. The service quality dimension such as empathy, information reliability, luggage assurance, responsiveness, service time reliability, external tangibles and tangibles exhibit the cause effect relationship with respect to overall satisfaction of passengers with technology mediation. This indicates that the mentioned service quality dimensions cause the passengers to achieve the overall satisfaction about the intercity bus transport. The service quality factors namely, information reliability, luggage assurance and responsiveness are positively associated with mediating variable namely technology, whereas environment is negatively associated.

These results indicate that technology mediate, that is, explains the relationship between exogenous variables namely environmental and responsiveness variables with overall satisfaction. Technology alleviates the influence of responsiveness and environmental dimensions on overall satisfaction. In the presence of technology interface in the intercity bus transport, the effect of responsiveness such as individual attention to passengers increases the overall satisfaction level among the passengers. Similarly, effect of environmental dimension increases the overall satisfaction level among the passengers in the presence of technology interface. Although technology influences the effect of responsiveness and environmental dimensions on overall satisfaction but just moderately and not to the greater extent.

With respect to passengers of high service quality preference, factors such as, empathy, external tangibles, tangibles and technology constructs are positively associated with overall satisfaction of intercity bus transport and significantly impact. The technology mediates the relationship between external tangibles, information reliability and responsiveness constructs with overall satisfaction. With respect to passengers of moderate service quality preference, the factors such as, tangibles construct is positively associated with overall satisfaction of intercity bus transport and significantly impact. The technology construct mediates the relationship between environmental, responsiveness and service time reliability with overall satisfaction.

With respect to passengers of low service quality preference, the factors such as, empathy, external tangibles, tangibles, luggage assurance and responsiveness constructs are positively associated with overall satisfaction of intercity bus transport and significantly impact. Hence, it is very important for intercity bus passenger transportation to give importance on empathy, external tangibles, tangibles, luggage assurance and responsiveness dimensions of service quality and practice it, because it has a direct and positive impact on overall satisfaction of transport service. The technology mediates the relationship between information reliability and environmental constructs with overall satisfaction.

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