

CUSTOMERS' PERSPECTIVE ON THE FACILITIES PROVIDED BY SOUTHERN EXPRESSWAY SERVICES, SRI LANKA

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Abstract - Southern Expressway is the first link of the Expressway network planned for Sri Lanka. "What is the customers' perspective on the current facilities provided by the Southern Expressway Services" is the research problem addressed by the study and based on that, evaluating the customers' perspective on the facilities provided by the Southern Expressway Services has been the objective of the study. Primary data was collected through a structured questionnaire, collected online and manually, targeting three hundred and fifty (350) passengers, travelled by both private and public modes of transportation based on the stratified random sampling technique and 78% valid responses received with 0.880 Cronach's Alpha value in Reliability Statistics of data. As per the descriptive analysis, attending to work stations and official travels are the main purposes of travelling among 41% of respondents and 54% are using their private vehicles. Moreover ninety three percent (93%) of the respondents considers expressways are as a modern need in the society. As per the Factor Analysis and the Principal Components Analysis, twelve components have been derived namely as Vantage factors, Road Directives, Value Added Service Factor, Penalty and Number of Toll Entrance and etc. Furthermore availability of a mini hospital in the Canowin arcade and a recreation centre are the main facilities recommended to be added and improved in Southern Expressway Services in the study and expanding the study for other express ways in Sri Lanka is a major recommendation for future researches.

Keywords: Expressways, Customer perspective, Factor Analysis

I. INTRODUCTION

The first form of transportation had been instigated thousands of years before the invention of wheel. Early humans walking the same paths repeatedly to get their daily needs promptly formed the first road system. During the eighteenth century, the development of private toll roads in the Europe and France showed a rapid growth in

road transportation. The development of Road rules were begun in 19th century. The first zebra crossing, double yellow lines at the sides of the roads for no parking, was introduced during this period (Lambert, 2014). During the industrial era, the evolution of automobile has changed and the future of roads and highway networks has developed with more facilities. Travellers demanded not only a safe road but also a good service and properly maintained facilities during their journey. The demand for high quality road services had become increased during this period. The transportation feasibility became an important role by acting as one of the major drivers of global competition (Basri, 2008). The Expressway is a Class 1 Highway, which is a divided arterial highway for through traffic with full or partial control of access and generally with grade separations at major intersections (Highway functional classification, 2013). The first expressway of Sri Lanka was the Southern Expressway (E01), which had been built by Road Development Authority Sri Lanka. It has been a welcome change to the existing road transportation network and a quite comfortable experience to the Sri Lankan travellers. The study is based on the customer perspective on the service quality of the Southern Expressway services from Kottawa to Goodagama. The Road Development Authority, Sri Lanka maintains the Southern Expressway (RDA, 2015).

To address the distance problem from Colombo harbour to Hambantota Airport the expressway had been built as a proposed project of Road Development Authority. The distance between Kottawa to Hambantota in A8 is 206 km. The distance from Kottawa to Matara in B158 is 150 km. The Southern Expressway has currently reduced the time taken to travel from Kottawa to Galle (116 km) to one hour from three hours and Kottawa to Matara (161 km) to one and half hours from four hours taken by the regular traveller in a A2 highway (Thassim, 2011). The Government of Sri Lanka and the Export and Import Bank of China had negotiated to fund the project with the aids from Japan Bank for International Corporation (JBIC) and the Asian Development Bank (ADB). JBIC had provided a loan

amounting dollar 2.05 billion (\$2.05bn) and ADB had provided dollar 1.03 billion (\$1.03bn). The Sri Lankan government had allocated Rs. 122.7 billion for road development. The cost of United States dollar 180 million (US \$180M), for four (04) lanes extension of the expressway to Hambantota had been being funded by the Exim Bank of China. The road from Kurundugahahetekma to Goodagama had constructed by Kumagai Gumi of Japan and the section had funded by the Asian Development Bank. The China Harbour Engineering Company and Taisei Corporation of Japan had constructed the expressway project. The supervision and monitoring done by the Roughton International Ltd, Halcrow Group Limited, Pacific Consultants International Co., Ltd. along with the Resources Development Consultants (RDC) (Roadtraffic-Technology, 2013).

Public transportation has been the most spectacular arm in land transportation. This dissertation has been addressing the service quality and customer satisfaction in Southern Expressway, which is a unseasoned experience to Sri Lankan travellers. Also, this bearing of the expressway transportation has not properly addressed by earlier researches in Sri Lanka as it has been a new experience to Sri Lankan land transportation.

"A problem well declares is a problem half-solved" (Kettering, 1947).

With reference to the above situation, the aim of the study has been generated as to evaluate the customers' perspective on the facilities provided by the Southern Expressway Services

The significance of the study expanded towards to heighten the efficiency and the productivity of Southern Expressway services and the overall structure of the dissertation has designed based on the research question, "What is the customers' perspective on the current facilities provided by the Southern Expressway Services"

I. METHODOLOGY AND EXPERIMENTAL DESIGN

A. Identification of Variables

Studies with similar panoramas have taken as guidance to develop the variables, which has used in research. The main variables have categorized under Infrastructure, Accessibility, Charges, Safety and Security, Driving aids, Usage of IT & Information, Service Quality and Rules & Regulations

1) *Road Infrastructure*: Empirical studies done by Himachal Pradesh Road and Other Infrastructure Development Corporation Ltd (2007) have diagnosed

"Quality of Roads and Bridges as a major factor that affect the customer satisfaction. John Gaffney (2006) has mentioned "timely information on changes in road conditions" as a very important factor for road users

2) *Accessibility*: John Gaffney (2006) has stated Accessibility as a most important attribute in ranking of user groups. In Malaysian highway, final thesis, they have stated that accessibility as an important in defining the nature of the highway service provider. In Government of India Ministry of Road Transport & Highways (2012) has mentioned, "It is important to provide urban linkages to National Expressways Network or to any inter-city Expressways developed by the State Governments".

3) *Charges*: In the study done by Limelight Limited (2012) have indicated highway toll charges as a factor finding effected to the customer satisfaction. Cost savings to user has recognized as a prominent factor in evaluating highway agency operation in Andrew Mellor (2013).

4) *Safety*: Limelight Limited (2012) has indicates that Safety is an important factor in customer satisfaction in highway road users. Eva Lodenius (2011) states that "Overall the results from customer satisfaction measurement show that drivers prioritize traffic safety"

5) *Driving Aids*: Stoplights, stop signs, interpretive signs had identified as driving aids in highways (Mellor, 2014). Lack of lighting & poor visibility had selected as factors driving customer satisfaction s (Gartner, 2002). A study on National Road Users Satisfaction Survey has stated that "Higher proportions had been aware of roadwork's in advance of their trip (65% compared with just 54% in 2011/12) with more finding out via road signs"

6) *Usage of IT & Information*: Andrew Mellor (2014) has indicated that information provision, electronic variable message signs (VMS), and static signs such, as blue signs have been important factors to rate the customer satisfaction in transportation system

7) *Service Quality*: In the empirical study carried on "Customer satisfaction measurement within the road sector" by Eva Lodenius (2011) has stated that the service level quality had been a major influence in customer perception on road networks. Zeithaml et al (1990) and Ona et al (2012) have given that the service quality had measured primarily from the customer's

perspective since customers are the sole judges of service quality

- 8) *Rules & Regulations:* Himachal Pradesh Road and Other Infrastructure Development Corporation Ltd (HPRIDC) have indicated that, Effective enforcement of traffic regulations; basic rules for road safety have been an important in highway performance.

B. *Research Methodology*

For the quantitative study, primary data has been collected through a structured questionnaire while the secondary data has been collected from books, journals and web based publications. Primary data collected through the questioner has been analysed using the software package for Social science research (SPSS) while the secondary data was referred to identify the variables for the structured questioner mainly.

C. *Population and Sample*

According to the readings done by RDA (2015) the total passengers travel in the southern Expressway from Kottawa to Goodagama (Mathara) during a day has counted as approximately 3000-vehicle units. The total passengers, travel in the southern Expressway from Kottawa to Goodagama (Mathara) was considered as the population of the research.

D. *Sampling Method*

Stratified random sampling was used to derive the sample from the population. Strata has been developed based on the total number of passengers travelled in the southern highway. Accordingly three hundred and fifty questionnaires have been distributed among the E01 (Southern Express Way) passengers by online and manually collected questionnaires.

E. *Sources of Data Collection*

Primary data has been collected by circulating a structured questionnaire to Expressway passengers (350) and the Secondary data has been used to attain a deep understanding on the topic, the variables and analytical methods. The semblance, phraseology and secondary data has taken from Journal articles, websites and books written by expertise in relevant field, i.e. RDA website

F. *Methods of Data Collection*

Three hundred and fifty questionnaires have been distributed among the passengers that have travelled in Southern expressway and only 273 valid responses have been received from the passengers. The 52 respondents has terminated the questionnaire before it has been

completed announcing that they were unable to respond due to personal issues, 9 respondents has failed to meet given instructions and criteria and 16 participants have not returned the questionnaire within the given time period. The overall valid response rate has been seventy eight percent (78%).

The questionnaire has been divided in to two parts as part A and part B. The part A is consisted of the questions on general information and part B is consisted of factors identified through the literature survey. The Likert scale has been used to weight the variables from one (1) to five (5) where the value 01 is represented not important and value 05 is represented the very important.

G. *Data Analysis Tools, Methods and Models*

SPSS, Statistical Package for Social Science has been used for the data analysis. Data coding has been done by converting qualitative data to numerical values. Cronbach's alpha test has been conducted to ensure the reliability of the data set and Bartlett's test has been used to test the equal variance of the data and the Kaiser-Meyer-Olkin (KMO) has been used to test the sampling adequacy of the data set to run a factor analysis. Descriptive statistics has been used to simplify the large amounts of data in a sensible way. The Crosstabs has provided a variety of measures in a two-way table. Factor analysis has been used as a statistical technique, and has created new factors to reflect the common idea of the cluster of variables used in the study.

II. RESULTS AND DISCUSSION

A. *Descriptive Analysis*

According to the descriptive analysis of the research, the sample has consisted with 46.2% percent of Public vehicles and 53.8% percent of Private vehicles' passengers and this has stated that the total passengers pass through the highway has used nearly equal number of both the vehicle modes and the study has addressed the satisfaction of both the travellers respectively. The most travellers are from the Western and Southern provinces. Male passenger percentage is greater than females.

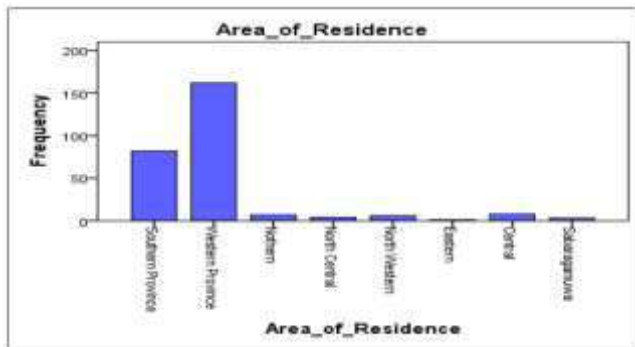


Figure 1. Area of Residence

Attending to work stations and official travels are the main purposes of travelling. Among 41% of respondents and 54% are using their private vehicles. Moreover 93% of respondents consider expressways are as a modern need in the society.

B. Descriptive Statistics of Variables

Vantage Factor (13.730% of variance), Road Rules and Visibility Factor (10.743% variance) and Availability of Value Added Service Factor with a variance of 10.596% has become considerable factors in customer satisfaction.

Penalty and No of Toll Entrance Factor with a variance of 6.186%, Food, Hygiene and Emergency Service Charge Factor with a variance of 5.430% and the Employee, Charges and Road Attractiveness with a variance of 5.394% become secondary considerable factor in E01 passenger satisfaction.

The "Rules and Punctuality at Entrance" with a variance of 4.008%, "convenience in driving" with a variance of 4.641%, User-friendliness in Ticketing with a variance of 4.610%, Safety and Good Care with a rotation sums of squared loadings variance of 4.308% has become tertiary considerable factor in customer satisfaction

C. Factor analysis

The Cronbach's Alpha valve of the data set has proven as .880, which has categorised as "Excellent Reliability figure". This has proved that the data set is reliable, hence can proceed with the data analysis

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.738
Bartlett's Test of Sphericity	Approx. Chi-Square	10021.605
	df.	990
	Sig.	.000

"The Kaiser-Meyer-Olkin" value of the data has appeared as .738. The value lay between $0.7 \leq KMO < 0.8$ and the data set has categorised as "middling figure". This has been proved that the data set could use for the factor analysis. Bartlett's test of Sphericity has given the significance level amounting .000 (which has been lay below $<.05$). This has been proved that the variables used in the study have not related with others thus the variables of the study have proved its unsuitability for structure detection. The data set has been achieved the requirement of validation for conducting a factor analysis.

D. Principal Components Analysis for Factor Extraction

The analysis had been withhold all the factors with eigenvalues exceed 1 (one) therefore the analysis has extracted twelve (12) principle components out of forty-five (45) variables used.

Table 2. Total Variance Explained Extracted using Principal Component Analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.443	23.206	23.206	10.443	23.206	23.206	6.179	13.730	13.730
2	5.650	12.555	35.760	5.650	12.555	35.760	4.834	10.743	24.473
3	3.148	6.995	42.756	3.148	6.995	42.756	4.768	10.596	35.070
4	2.550	5.666	48.421	2.550	5.666	48.421	2.784	6.186	41.255
5	2.174	4.832	53.253	2.174	4.832	53.253	2.444	5.430	46.686
6	1.867	4.149	57.403	1.867	4.149	57.403	2.427	5.394	52.079
7	1.806	4.012	61.415	1.806	4.012	61.415	2.088	4.641	56.720
8	1.542	3.428	64.843	1.542	3.428	64.843	2.074	4.610	61.330
9	1.474	3.276	68.118	1.474	3.276	68.118	1.939	4.308	65.638
10	1.280	2.845	70.963	1.280	2.845	70.963	1.804	4.008	69.647
11	1.145	2.544	73.508	1.145	2.544	73.508	1.442	3.205	72.851
12	1.133	2.517	76.025	1.133	2.517	76.025	1.428	3.174	76.025

E. Principal Components Extracted from Factor Analysis

Component 01: Vintage Factor Model-The component 01 consist of all the user easiness factors such as, "after accident maintenance, no of interchanges to e01, service 24 hr., price for the sanitary services, price of food in Canowin arcade, guidance to travellers in route selection, information provided on ticket, information on emergency situations, efficiency of responsiveness to user problems, notice boards indicating weather change and intersections are clearly indicated." This factor has a higher level of influence towards the customer satisfaction in E01 as it has gained 13.730% of variance.

Component 02: Road Rules and Visibility Factor-The road rules and visibility factor has include, visibility of road indicators, road information on intersections, clear indication of maintenance activities, restrictions to vehicle capacity, information contained electronic signs,

compulsory of wearing seat belt and speed limitations. The factor has gained 10.743% variance

Component 03: Availability of Value Added Service Factor- This factor include all the value added services such as, timely assistance of emergency officers, police service availability, availability of ambulance staff, vehicle maintenance, space for parking, food quality in outlets and cleanness of service area. This factor has a variance of 10.596%.

Component 04: Penalty and No of Toll Entrance Factor- This factor has consisted of No of toll at Entrance and Over Speeding Penalty with a variance of 6.186%.

Component 05: Food, Hygiene and Emergency Service Charge Factor- This component has developed with amount of charges for emergency services, cleanness of parking area and variety of foods in outlets. This has a variance of 5.430%.

Component 06: Employee, Charges and Road Exit Attractiveness- The variables such as amount of charges for each vehicle type, no of toll at exit, no of lanes, employees wearing proper attire has included in the component 06 with a variance of 5.394%.

Component 07: Convenience in Driving- The component 07 consists of Information Contained on Road Signs and Restriction of Billboard Displaying with a variance of 4.641%.

Component 08: User-friendliness in Ticketing- The component 08 has included the easiness factors in ticketing such as, price of ticket for bus passengers and online ticket booking facility with a variance of 4.610%.

Component 09: Safety and Good Care- The component on safety and Good-care has developed on user complain handling and fencing in preventing animal intrusions with a rotation sums of squared loadings variance of 4.308%.

Component 10: Rules and Punctuality at Entrance- Entry restricted vehicles and time taken to issue a ticket has extracted as the component 10 with a variance of 4.008%.

Component 11: Road Infrastructure- The component 11 has included with the variables, Lights on Bridges Road Bends Exit and Road Condition with a variance of 3.205%.

Component 12: Pharmacy Availability- The availability of pharmacy in the Canowin Arcade has become the 12th component with a lowest variance value, i.e. 3.174%.

As the extraction values of the community table has been higher than 0.5, the model of the factors, is mathematically valid. i has been the variable ($i = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12$) and α is the Component Score Coefficient Matrix of each variable.

$$F_i = f\{\sum(\alpha * \text{Variables of the each component } i)\}$$

III. CONCLUSIONS

A. Limitations of The Study

The domain of the research has bounded to Southern Expressway only. As there have been only three expressways in Sri Lanka, the study has been based on customer satisfaction level of passengers in Southern Expressway segment only.

The passengers from outer circular highways to Goodagama, i.e. from Kaduwela, Kadawatha and Kerawalapitiya have not been considered for this survey. The survey results might have more vibrant if the research has conducted with a time period of a one year and the results might have given a clear picture of the satisfaction level of population throughout a year.

B. Conclusion and Recommendation In Research Analysis

As the statistical approach has declared customer demanding of the E01 has demanded a "pharmaceutical facility" within the Expressway recreation centre. The requirement of pharmacy in the Canowin Arcade has become the component with variance value, i.e. 3.174%. According to the recommendations reviewed by the respondents several passengers has directly demanded a mini hospital facility inside the Canowin Arcade. The "Road Infrastructure" factor, had a variance of 3.205% is also an influential factor of customer satisfaction in Expressway system. It has included Lights on Bridges Road Bends Exit and Road Condition. The two extracted factors, "Pharmacy Availability" and "Road Infrastructure" have a higher influencing ability than other factors in Southern Expressway customer satisfaction process.

Vantage Factor (13.730% of variance), Road Rules and Visibility Factor (10.743% variance) and Availability of Value Added Service Factor with a variance of 10.596% has become considerable factors in customer satisfaction.

Penalty and No of Toll Entrance Factor with a variance of 6.186%, Food, Hygiene and Emergency Service Charge Factor with a variance of 5.430% and the Employee,

Charges and Road Attractiveness with a variance of 5.394% become secondary considerable factor in E01 passenger satisfaction.

The "Rules and Punctuality at Entrance" with a variance of 4.008%, "convenience in driving" with a variance of 4.641%, User-friendliness in Ticketing with a variance of 4.610%, Safety and Good Care with a rotation sums of squared loadings variance of 4.308% has become tertiary considerable factor in customer satisfaction.

As the Expressway systems in Sri Lanka become more develop with the customer demanding, the connection between the every corner of the country will linked and passengers will be more benefited with the service. The MR port and the commercial city of Sri Lanka will be linked with the said Southern Expressway in the near future and the finding of this study can be taken in to consideration for the betterment of the future of the E01 Expressway.

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