WCTR 2013 RIO

SELECTED PROCEEDINGS

URBAN BUS TRANSPORT SERVICE QUALITY AND SUSTAINABLE DEVELOPMENT: UNDERSTANDING THE GAPS

MEGHNA VERMA (CORRESPONDING AUTHOR), M. S. RAMAIAH INSTITUTE OF MANAGEMENT,BANGALORE-54, INDIA MEGHNA@MSRIM.ORG

ASHISH VERMA, ASST.PROFESSOR, DEPT. OF CIVIL ENGINEERING, IISC BANGALORE,INDIA–560012ASHISHV@CIVIL.IISC.ERNET.IN

AJITH P., STUDENT, M. S.RAMAIAH MANAGEMENT INSTITUTE, BANGALORE-54, INDIA.AJITHP1988@GMAIL.COM

SNEHA SINDHE, STUDENT, M. S. RAMAIAH MANAGEMENT INSTITUTE, BANGALORE-54, INDIASNEHAS.SINDHE@GMAIL.COM

This is an abridged version of the paper presented at the conference. The full version is being submitted elsewhere. Details on the full paper can be obtained from the author.

ISBN: 978-85-285-0232-9

13th World Conference on Transport Research

www.wctr2013rio.com

15-18 JULY 2013

Rio de Janeiro, Brazil

unicast

URBAN BUS TRANSPORT SERVICE QUALITY AND SUSTAINABLE DEVELOPMENT: UNDERSTANDING THE GAPS

Meghna Verma (Corresponding Author), M. S. Ramaiah Institute of Management, Bangalore-54, India
meghna@msrim.org

Ashish Verma, Asst. Professor, Dept. of Civil Engineering, IISc Bangalore, India – 560012
ashishv@civil.iisc.ernet.in

Ajith P., Student, M. S. Ramaiah Management Institute, Bangalore-54, India
ajithp1988@gmail.com

Sneha Sindhe, Student, M. S. Ramaiah Management Institute, Bangalore-54, India
snehas.sindhe@gmail.com

ABSTRACT

Public transport systems are known to be sustainable modes in terms of space and energy efficiency, and environmental and social benefits. A good networked public transportation system with time-bound schedules, reliable services, comfort, competitive travel times and affordable prices, are some of the required traits for providing sustainable transport services and commuter satisfaction. The objective of the proposed study is to measure gap between commuters' expectations of urban bus transport services and the actual service quality provided. The SERVQUAL framework, which is a multi-item instrument used for measuring service quality, is used to measure gap between commuters' expectations of urban bus transport services and the actual service quality provided. Bangalore Metropolitan Transport Corporation (BMTC), which is among the few profit-making urban public bus transport organization in India, is taken as the case study for understanding the said gap. While the services of BMTC are very competitive among any other urban public bus transport organization in the country, they are still to reach the desired level of passenger mode share that will enable them to provide sustainable mobility solution to the commuters in Bangalore. The statistical analysis of the results shows that the expectations are higher than perception, particularly with respect to empathy dimension. The results of this study may help organizations like BMTC to bridge the gap between commuters' expectations and actual service quality and to work towards developing sustainable services.

Keywords: SERVQUAL, Urban Bus Transport, Service Quality, Sustainable Development, BMTC, India.

INTRODUCTION

Passenger transportation has an impact on all aspects of mobility and is an important part of overall economic development. Improving the performance of public transport undertakings is becoming more and more critical due to the paucity of public funds, increased demand on transport services and expanding social needs. Of late, the performance measurement and evaluation systems have been gaining importance (Kittelson Associates et. al. 2003, Sulek and Lind 2000). Increased urbanization has increased the number of passenger vehicles in the cities in developing countries such as India. The Road Transport Corporations Act came into effect in India in 1950 and led to various state governments setting up respective State Road Transport Corporations with an objective of providing affordable transport services within the state as well as across states. Over the years, most of these corporations have become loss making. The trade-off between commercial objectives and social responsibility goals of these state owned corporations became an issue of major concern.

The objective of the proposed study is to measure gap between commuters' expectations of urban bus transport services and the actual service quality provided. The SERVQUAL framework is used to measure gap between commuters' expectations of urban bus transport services and the actual service quality provided. SERVQUAL is a multi-item instrument that is used for measuring service quality. Bangalore Metropolitan Transport Organization (BMTC), which is among the few profit-making urban public bus transport organization in India, is taken as the case study for understanding the said gap. While the services of BMTC are very competitive among any other urban public bus transport organization in the country, they are still to reach the desired level of passenger mode share that will enable them to provide sustainable mobility solution to the commuters in Bangalore.

LITERATURE REVIEW

Recent research suggests a strong link between public transport services and social sustainability (e.g. Schlossberg and Zimmerman, 2003, Dennis and Liberman, 2004). Hill and Duggan (2006) illustrated the importance of this relationship through a case study of Oakgrove Millennium Community in Milton Keynes, UK. The authors noted the need for a high quality, integrated public transport plan in order for the community to be a beacon of environmental and social sustainability. Increasing congestion and car journey times often weakens the social network of residents and hence the authors argued the importance of 'community efficiency' over 'car efficiency'. Similarly, Williams and Dair (2007) argued for a good public transport network to positively shape sustainable behaviours in neighbourhood-scale developments.

However, the truth is that good public transport service quality remains an elusive dream for many cities and communities. Low and Gleeson (2003) observed that truly sustainable

transportation has not been achieved in any region of the world. There are obviously many contributing factors to this unsatisfactory and grim state of transport. Banister (2005) in his book *Unsustainable Transport: City Transport in the New Century* listed the major policy influences on transportation as: institutions and organizations, technology, finance, urban forms and culture.

Public transport must be perceived as an attractive alternative to the car. As such, good public transport which provides comfort, convenience and reliability, is the key to a more sustainable future. Roseland (1998) opined that sustainable development begins at the local community level. In this regard, he recommends a bottom-up over top-down approaches and a local rather than a regional, national and international focus. His views were shared by Tengstroem (2003), who identified intense communications and constructive conflicts between citizens and politicians, as well as more citizen involvement, as necessary preconditions in making urban transport more sustainable. Similarly, Hine (2003) urged a reinterpretation of the interaction between land use and transport as well as additional interactions with society and lifestyles.

Keirstead and Leach (2008) introduced the concept of a service-niche approach as an alternative framework to represent an urban system that would inform appropriate sustainable policy responses. 'Rather than using indicators primarily to track resource flows (as in an urban metabolism approach), the service niche model focuses on a population's demand for energy services and then considers how these services lead to resource consumption and consequent impacts' (Keirstead and Leach, 2008). A major energy consuming activity is transportation and this is in part driven by the state of public transport services.

Finland is arguably a leader in sustainable development and their sustainability indicators have always included the measurement of public transport service quality (Lyytimaki and Rosenstrom, 2008). The establishment of a rigorous measurement of existing public transport service quality from a user community's perspective is a first step that may shed broad light on the areas of deficiency and inform the strategy for achieving a sustainable public transport network. However, the measures of public transport service quality have been piecemeal. The items of measurement often relate to the general satisfaction level with public transport. The non-targeted approach provides little insight for improving public transport services and impedes the achievement of sustainability goals.

Considering these drawbacks Too and Earl (2010) introduced a SERVQUAL framework for measuring public transport service quality, and to identify the key performance requirements for public transport services by applying the framework to a master-planned community within Australia. The current study adopts this framework to demonstrate its application over an Indian case study of BMTC. The next section presents the proposed methodology.

PROPOSED METHODOLOGY

The objective of the proposed study is to measure gap between commuters' expectations of urban bus transport services and the actual service quality provided. The SERVQUAL framework is used to measure gap between customers (commuters) expectations of public transport services and the actual service quality provided. SERVQUAL is a multi-item instrument for measuring service quality. This instrument was first developed by Parasuraman et al. (1985) through an exploratory study of marketing academics. The outcome was a 22-item scale that has received widespread application in the research of service quality. The 22-items are essentially framed around the following five dimensions of service quality:-

- Tangible: Physical facilities and equipment
- Reliability: Ability to perform the promised service dependably and accurately
- Responsiveness: Willingness to help customers and provide prompt service.
- Assurance: Knowledge and courtesy of employees and their ability to inspire trust and confidence.
- Empathy: Caring and individual attention the firm provides to customers

Using the above five dimensions of service quality, the parameters related to case study were identified under each of the five dimensions. Accordingly a survey questionnaire (Appendix-1) was developed to obtain the required data for analysis. Finally, statistical analysis using t-test was done to identify, measure, and interpret the gaps between perception and expectation. The next section discusses the case study application.

CASE STUDY

Bangalore Metropolitan Transport Corporation (BMTC), which is among the very few profit-making urban public bus transport organizations in India, is taken as the case study for applying the proposed approach. BMTC operates about 6000 routes in Bangalore city and has a fleet of more than 6100 buses with a considerable number of luxury (Volvo and Mecedez-Benz) buses to its credit. It carries about 4.5 million passengers' every day and has a very efficient bus staff ratio of 5.3. While the services of BMTC are very competitive among any other urban public bus transport organization in the country, they are still to reach the desired level of passenger mode share that will enable them to provide sustainable mobility solution to the commuters in Bangalore city. Also, while BMTC is currently modernizing the bus fleet, to improve its services and mode share, through funding under Jawaharlal Nehru National Urban Renewal Mission (JnNURM) scheme, there is still very little focus on improving overall service quality to improve commuter patronage. The outcome of the study may help BMTC to bridge the gap between commuters' expectations and actual service quality and to work towards developing sustainable services..

DATA COLLECTION AND ANALYSIS

Sampling

The main intent of this study is to measure gap between commuters' expectations of urban bus transport services and the actual service quality provided. The empirical data were collected using a questionnaire. 196 samples of Bus Commuters were selected from different regions of Bangalore, using snow ball sampling technique. The questionnaires were distributed personally and also by using the social media networks like Facebook. An online version of the questionnaire was also distributed using Google Docs. to the potential respondents. Out of 196 responses, 186 were usable, since 10 questionnaires received were partially filled and cannot be used for analysis. This shows 94.87% response rate. Thus the actual sample size used for analysis was 186.

Analysis of Data and Results

- ***Variable Measurement***

A total of 50 questions were used to measure the service quality of bus services in Bangalore based on five dimension defined by Parasuraman et al. (1985). All questions were designed as closed ended questions using 7-point Likert scale varying from strongly disagree (1) to strongly agree (7). Sample questionnaire is shown in Appendix 1.

- ***Sample Profile***

The demographic and travel profile of the respondents is shown in Table 1 to Table 3 which includes gender, age group, marital status, education profile, income range per month, occupation of respondents, various types of buses used by the respondents & frequency of bus travel.

SURVEY RESULTS

Demographic Profile of Respondents

There is a notable difference in the genders using Urban Bus Services from the respondents. 63% of the total respondents were male commuters and 36% were female. 67.74% of the users were in the age group of 20-25 which shows that the commuters (among the respondents) are mostly the young generation i.e. the students & the neo-working class.

Service Quality Gaps

The questionnaire which was developed consisted of 2 sets of items each set had 25 questions. The first set was used to measure the perceived levels of service quality (P). The same set of questions were reframed/ rephrased to inquire the users' expectations of the service quality (E). Questions under each dimension were rated using a 7 point Likert scale.

Table-1 Demographic Profile of the Respondents

Characteristics		No. of Respondents	Percentage of Respondents
Gender	Male	115	62%
	Female	71	38%
Age	Below 20	12	6%
	20-25	123	66%
	25-30	34	18%
	35-45	6	3%
	45 & above	11	6%
Marital status	Married	35	19%
	Unmarried	151	81%
Education	Under - Graduate	26	14%
	Graduate	68	37%
	Post-graduate	92	49%
Income Range/Month	Below 5000	52	28%
	5000-10000	30	16%
	10000-20000	48	26%
	20000 & above	56	30%
Occupation	Student	125	67%
	Government employee	4	2%
	Own business	7	4%
	Private company employee	38	20%
	Others	12	6%

Table-2 Types of Buses used by the Respondents

Bus Type	No. of respondents	percentage of respondents
Vajra	46	25%
BIG 10	5	3%
Suvarna	12	6%
Ordinary	101	54%
Pushpak	10	5%
Others	12	6%

Table-3 Frequency of bus travel

Frequency of bus travel	No. of respondents	Percentage of Respondents
Daily	58	31%
Occasionally	72	39%
Rarely	56	30%
Never	0	0%

A gap analysis was conducted on each dimension of the SERVQUAL (Parasuraman et. al., 1988) taking averages of individual items under each dimension and by subtracting the expectations from the perceptions (P-E). The average of the perceptions score and the expectations score results are tabulated below in Table 4. The comparison of average of each of these dimensional scores is shown in Figure 1, which clearly shows that the perceptions of the commuters' are below the expectations of the services provided by the BMTC in all the dimensions, and the gap is much wider in case of Empathy Dimension.

Table 4: Comparison of Perceptions and Expectations of Respondents

Dimensions	Average perception score (P)	Average expectation score (E)	Difference (P-E)
Reliability Dimension			
Bus information – schedule & route maps are available & reliable	3.806452	5.451613	-1.64516
Buses are available on time during peak hours	3.704301	5.715054	-2.01075
Buses are available to every area in the city	3.994624	5.682796	-1.68817
Frequency of buses is very high on every route	3.456989	5.526882	-2.06989
Computerized ticketing system leaves little scope for cheating & bribing	5.021505	5.682796	-0.66129
Tangible Dimension			
Buses are clean and well maintained	4.064516	5.827957	-1.76344
Buses are a safe mode of transport	5.016129	5.887097	-0.87097
Buses are the best mode for advertising & campaigning	4.478495	4.930108	-0.45161
Eco-friendly buses are used	4.016129	5.822581	-1.80645
Bus stops are well maintained	3.301075	5.860215	-2.55914
Responsiveness Dimension			
Bus tickets are affordable and buses are a real value for money	4.634409	5.763441	-1.12903
Bus routes are not lengthy	4.021505	5.306452	-1.28495
Bus stops are conveniently located	4.489247	5.548387	-1.05914
Response time to resolve complaints is very low	4.344086	5.365591	-1.02151
Bus information is easily available through calls, SMS's & on the Internet	3.844086	5.811828	-1.96774
Assurance Dimension			
Drivers & Conductors are courteous	3.860215	5.715054	-1.85484

There is a lot of safety measures against crime on buses	3.913978	5.741935	-1.82796
There are very little accident damage caused by buses	4.086022	5.682796	-1.59677
Drivers are well trained and safety measures are taken care of	4.225806	5.88172	-1.65591
Fire & Emergency Exits are available on all buses	4.268817	5.865591	-1.59677
Empathy Dimension			
Bus is user friendly for handicapped	3.543011	5.973118	-2.43011
Seats are available on every bus	3.11828	5.44086	-2.32258
Buses are safe for young mothers	3.403226	5.860215	-2.45699
There is first aid available on every bus	3.096774	5.827957	-2.73118
Destination Displays Systems are useful for visually impaired & aged	4.33871	5.930108	-1.5914

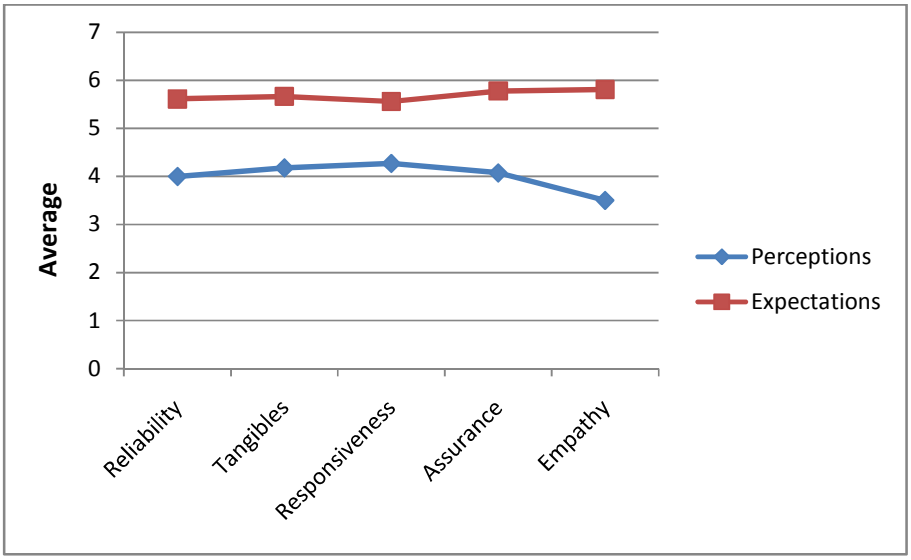

Figure-1: SERVQUAL Dimension Gaps between Expectations and Perceptions

Interpretation of the Gap Analysis

Following are three possible outcomes and the interpretation for the gap analysis shown in Table 4 is done in this section:

- P-E > 0, this implies that the users are satisfied with the level of service being provided.

- P-E = 0, this implies that the satisfactory levels are just being touched or reached.
- P-E < 0, this implies that the satisfaction levels are low.

An average of perceptions' & the expectations' scores of each of the dimensions in the questionnaire is calculated and plotted in the line graph as shown in Figure1. The graph clearly shows that perception of the commuters in all dimensions of service quality falls below their expectation i.e. the difference P-E < 0, quite clearly, the service quality at present levels is not satisfactory to the commuters, which implies that there is a gap in the service quality offered and the expectations of the users. Analysis indicates that the bus services provided within Bangalore region have to improve in all the 5 dimensions of Reliability, Tangibility, Responsiveness, Assurance & Empathy Dimension as all the dimensions have negative average scores. Commuters indicate the biggest overall service quality gap in the Empathy Dimension where commuters are asking for safety for young mothers, seat availability on the buses, provision for the disabled, availability of First Aid & Destination Display Systems for the visually impaired & aged. Each of the five dimensions is discussed in detail below:

Reliability Dimension

The reliability dimension elaborates the ability of the BMTC Buses to perform the promised service dependably and accurately. This dimension elaborates the availability of the service during peak traffic hours, reliability of public transport in all areas of the city as well as the trustworthiness of the computerised ticketing system which has been recently introduced. The negative scores on all these areas of focus shows that the expectations are higher than the perceptions and that the BMTC Bus services should improve in all the areas of focus such as timely availability of Buses during peak traffic hours, providing reliable transport to all areas of the city and providing more number of Buses for the convenience of the commuters. Since, BMTC services run in mixed traffic conditions without any priority assigned to them either through bus-lanes or junction priority, it results in un-reliable operations in terms of travel-time delay, uncertainty of bus arrival at bus stops etc. Also, BMTC services are point-to-point services and the routes and schedules have traditionally evolved over time based on thumb-rules and depot managers' experience without using any scientific models, resulting in complex networks and sub-optimal operations. These could be some of reasons that explain the gap observed between expectations and perceptions. Since, private vehicle users also suffer because of peak-time traffic and delay, the gap is comparatively not so wide as compared to Empathy dimension.

Tangible Dimension

The tangible dimension expounds the physical facilities and equipment of the BMTC Buses in terms of safety, cleanliness and maintenance of the Buses as well as the Bus Stops. All the values in the gap analysis shows negative values indicating that the BMTC Bus Service scores low again on the tangible dimension. Commuters expectations are not met by the BMTC Services, the buses and the bus stops are not clean and well maintained, the safety of the commuters is not taken care of as expected by the public. While there are reasonably good bus-shelters at many places, unfortunately, there are still some bus-stop

locations in Bangalore where there is not even a sign-board to indicate that it is a bus stop (only the bus crew and regular commuters know that it is a bus-stop) and at many other places there is a just a sign-board but no shelter facility. The fact that bus stops (a major service parameter for BMTC) come under the purview and control of Municipal Corporation of Bangalore and not BMTC is the main reason for this apathy of bus stops and the gap that we see in expectation and perception. Also, BMTC runs differential services for different economic sections of the society, and while the premium air-conditioned buses are comparatively more eco-friendly and well maintained the ordinary services are not so resulting in an overall gap in expectations and perceptions. Growing instances of BMTC buses involved in road accidents within Bangalore (as per the statistics from Bangalore Traffic Police) also explains the gap.

Responsiveness Dimension

The responsiveness dimension elaborates on the willingness of the service providers to help customers and provide prompt services. The gap analysis shows the values are negative and the expectations are not met in this case either. Overall, it shows that the bus stops may not be conveniently located, bus routes are lengthy and the response time to resolve complaints is high according to the perceptions of the commuters. As also explained earlier, routes and schedules of BMTC services have traditionally evolved over time based on thumb-rules and depot managers' experience without using any scientific models, resulting in complex networks and sub-optimal operations. This leads to lengthy bus routes in many case and bus stop distances and locations not very convenient for commuters. This is also due to lack of jurisdiction and control of BMTC on the bus stops. Further, the bus fares charged by BMTC, although are cheaper if compared internationally, are actually among the highest compared with bus fares in other Indian cities. Having this comparison in mind the commuters may perceive the services to be costly as compared to what they expect. Also, passenger information systems (PIS) for public transport are generally very poor in India and are still to reach a level of sophistication and satisfaction that will make people to use public transport. BMTC has shown promising improvements in their PIS in recent past but it is still perceived below the expected levels by the respondents.

Assurance Dimension

This dimension accesses the knowledge and courtesy of employees and their ability to inspire trust and confidence in their services. The gap analysis shows all the values on the negative scale which implies that the overall BMTC Service Quality in the Assurance dimension falls below the expectations of the commuters. Also, the wide gap with respect to all parameters of this dimension (refer, Table-4) shows that this dimension fairs 2nd worst after the Empathy dimension. The overall interpretation of this gap will be that drivers and conductors are not well trained to behave courteously with the public, fire and emergency exits are not available on all buses and there are instances of theft and crime that takes place on the buses. Thus the perceptions are lower than the expectations of the general public. Real instances of bad behaviour by bus crew and crime, especially against women in buses, as reported in news media from time-to-time, explain the existence of this gap.

Absence of CCTV cameras in buses, presence of open doors leading to occasional falling of passengers from buses etc. explains the below expectation perception of the respondents on the safety aspects. Absence or non-functioning of emergency exits, particularly in ordinary services of BMTC, also has bearing on the results obtained.

Empathy Dimension

The empathy dimension expounds on the care and individual attention the firm provides to customers by improvising and adding new features to the services which are user friendly to the differently abled, young mothers and the safety of the passengers/commuters. As was expected by the authors, the gap analysis reveals that the expectations' score in this dimension is much higher as compared to the other dimensions and performs the worst. The commuters expect the buses to have a first-aid boxes, the bus should be user friendly for the handicapped and should be safe for young mothers, destination audio-visual displays should be provided on all buses so that it will be of help for the aged and the visually impaired. While these are certainly pertinent issues with BMTC, they are generally compounded due to a disabled un-friendly transport infrastructure prevalent in Indian cities including Bangalore, which includes footpaths with high kerbs, absence of ramps, unsafe crossings; major fleet of high floor buses, bus terminal and stops that lacks facilities for disabled, absence of tactile surface for aiding visually impaired, etc. All these aspects need substantial improvements to bring Empathy dimensions above the expected levels.

T-Test Analysis

In order to statistically validate the results, a paired sample t-test was conducted for all the dimensions to evaluate the statistical significance of gap between expectations and perceptions and the results are shown in Table 5. The null hypothesis for each dimension is defined as:

H_0 : There is no significant difference in commuters perception and expectation of BMTC Bus service quality in Bangalore.

As the sample size is large, the t-value corresponds to probabilities for a standard normal distribution. The t values for all the 5 dimensions i.e. Tangibility, Reliability, Responsiveness, Assurance and the Empathy dimension was found to be significantly high as shown in Table-5. At 5% level of significance, all the values above 1.96 in the t - table are considered as not satisfactory. Hence there is not enough evidence to accept the null hypothesis. The results presented in Table-5 show that the t-values falls just out of the upper limit considering 95% confidence limits and this implies that the expectations of the commuter's falls a little above the services that is offered by the Bangalore Metropolitan Transport Corporation.

Table-5: t-test

Dimensions	Paired differences					t-value	Degree of Freedom (df)
	Mean of (P-E)	Standard deviation	Standard error	95% Confidence interval of the difference			
				Lower	Upper		
Reliability	8.0752688	10.11046	0.741334	6.622254	9.528283	10.8636	185
Tangibles	7.4516129	9.782517	0.717289	6.045726	8.857499	10.3606	185
Responsiveness	6.46237	9.99411	0.732804	5.026074	7.898666	8.7949	185
Assurance	8.53226	10.99147	0.805934	6.952629	10.11189	10.5583	185
Empathy	11.5323	11.298	0.82841	9.908616	13.15598	13.8835	185

The overall results of this study also explains some of the reasons for the un-sustainable trend in Indian cities, including Bangalore, of exponential growth of car ownership and its usage and the corresponding transport externalities resulting from this trend. Due to overall higher levels of expectations than perceptions from bus transport and a particularly wider gap on Empathy dimension, the commuters shift to cars as soon as they are able to afford it. Also, Indian cities have higher level of two-wheeler usage, which is cheaper and flexible to use than buses.

SUMMARY AND CONCLUSIONS:

This study has examined the gap that lies in between the expectations and the perceptions of BMTC users. The study also illustrates the application of the SERVQUAL instrument for measuring Urban Bus Transport Service Quality with an Indian case study of Bangalore city. There have been very few instances of such application in research literature related to assessment of public transport services using SERVQUAL.

The overall scores on all the service quality dimensions i.e tangible, reliability, responsiveness, assurance and empathy shows that the expectations of most of the users are not met by the Urban Bus Transport Service Providers. The gap between perception and expectation is particularly wider with respect to Empathy dimension. While the underlying reasons are well within the purview of BMTC, there are also reasons, as explained in the interpretation, that are beyond the direct control of BMTC and are related to overall issues of transport infrastructure and governance. The current overall gap between perception and expectation also explains the current un-sustainable trend of growth in car ownership and usage.

LIMITATIONS AND FUTURE STUDIES

The sample size for the study is small with respect to the total population, which can be improved further to improve the accuracy of the results.

The present study is limited to cosmopolitan city of Bangalore. For better understanding of urban bus transport systems in the country the study can be extended to the other cities in India as well. Further studies can also be done to statistically correlate the interpretations made and correlation to sustainability.

Also, to link customer satisfaction with employer attitude, an attitude survey of employees can also be carried out.

REFERENCES

Banister D. 2005. *Transport: City Transport in the New Century.* Routledge: New York.

Dennis LM, Liberman A. 2004. Indicators of a healthy and sustainable community. *The Health Care Manager* **23**(2): 145–155.

Hill S, Duggan J. 2006. Grid or change in Milton Keynes. *Regeneration and Renewal* **6**: 10.

Hine P. 2003. How can integration of planning and transport be achieved? *Planning* **1545**: 36.

Keirstead J, Leach M. 2008. Bridging the gaps between theory and practice: a service niche approach to urban sustainability indicators. *Sustainable Development* **16**: 329–340.

Kittleson Associates, Urbitran Associates, LKC Consulting Services, MORPACE International, Queensland University of Technology and Y. Nakanishi, 2003. A Guidebook for Developing a Transit Performance Measurement Systems, Transit Cooperative Research Program Report 88, Washington D. C., Transportation Research Board

Low N, Gleeson B. 2003. *Making Urban Transport Sustainable*. Palgrave Macmillan: New York.

Lyytimaki J, Rosenstrom U. 2008. Skeletons out of the closet: effectiveness of conceptual frameworks for communicating sustainable development indicators. *Sustainable Development* **16**: 301–313.

Parasuraman A., Zeithaml V A, Berry L L., 1985, “A conceptual model of service quality and its implications for future research”, Journal of Marketing 49: 41-50.

Roseland M. 1998. *Toward Sustainable Communities: Resources for Citizens and Governments*. New Society: New York.

Schlossberg M, Zimmerman A. 2003. Developing statewide indices of environmental, economic, and social sustainability: a look at Oregon and the Oregon Benchmarks. *Local Environment* **8**: 6.

Sulek, J. M., and M. R. Lind, 2000. "A Systems Model for Evaluating Transit Performance, Journal of Public Transportation, 3 (1): 29-47.

Too L., and Earl G. 2010, "Public Transport Service Quality and Sustainable Development: a Community Stakeholder Perspective", *Sust. Dev.* 18, 51–61.

Tengstroem E. 2003. Transport sustainability in Denmark, Sweden and the Netherlands. In *Making Urban Transport Sustainable*, Low N, Gleeson B (eds). Palgrave Macmillan: New York; 132–148.

Williams K, Dair C. 2007. A Framework of Sustainable Behaviours that can be Enabled through the Designs of Neighbourhood-Scale Development. *Sustainable Development* **15**: 160–173.

APPENDIX 1

***PERCEPTIONS*:**

The following questions are based on your perceptions about BMTC Bus services:

Reliability Dimension	Strongly Agree						Strongly Disagree
Bus information – schedule & route maps are available & reliable	7	6	5	4	3	2	1
Buses are available on time during peak hours	7	6	5	4	3	2	1
Buses are available to every area in the city	7	6	5	4	3	2	1
Frequency of buses is very high on every route	7	6	5	4	3	2	1
Computerized ticketing system leaves little scope for cheating & bribing	7	6	5	4	3	2	1

Tangibles Dimension	Strongly Agree						Strongly Disagree
Buses are clean and well maintained	7	6	5	4	3	2	1
Buses are a safe mode of transport	7	6	5	4	3	2	1
Buses are the best mode for advertising & campaigning	7	6	5	4	3	2	1
Eco-friendly buses are used	7	6	5	4	3	2	1
Bus stops are well maintained	7	6	5	4	3	2	1

Responsiveness Dimension	Strongly Agree						Strongly Disagree
Bus tickets are affordable and buses are a real value for money	7	6	5	4	3	2	1

Bus routes are not lengthy	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Bus stops are conveniently located	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Response time to resolve complaints is very low	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Bus information is easily available through calls, SMS's & on the Internet	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Assurance Dimension	Strongly Agree						Strongly Disagree
Drivers & Conductors are courteous	**7**	**6**	**5**	**4**	**3**	**2**	**1**
There is a lot of safety measures against crime on buses	**7**	**6**	**5**	**4**	**3**	**2**	**1**
There are very little accident damage caused by buses	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Drivers are well trained and safety measures are taken care of	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Fire & Emergency Exits are available on all buses	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Empathy Dimension	Strongly Agree						Strongly Disagree
Bus is user friendly for handicapped	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Seats are available on every bus	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Buses are safe for young mothers	**7**	**6**	**5**	**4**	**3**	**2**	**1**
There is first aid available on every bus	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Destination Displays Systems are useful for visually impaired & aged	**7**	**6**	**5**	**4**	**3**	**2**	**1**

***EXPECTATIONS*:**
The following questions are based on your expectations from BMTC Bus services:

Reliability Dimension	Strongly Agree						Strongly Disagree
Bus information like schedule & route maps should be available & reliable	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Buses should be more frequent during peak hours	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Buses should be available to every area in the city	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Buses should be frequent on every route	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Every bus should have computerized ticketing system so that there is no scope for cheating & bribing	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Tangibles Dimension	Strongly Agree						Strongly Disagree
Buses must clean and well maintained	7	6	5	4	3	2	1
Buses should be made a safe mode of transport	7	6	5	4	3	2	1
Buses can be used as the best mode for advertising & campaigning	7	6	5	4	3	2	1
Eco-friendly buses should be used	7	6	5	4	3	2	1
Bus stops have to be well maintained	7	6	5	4	3	2	1

Responsiveness Dimension	Strongly Agree						Strongly Disagree
Bus tickets must be affordable and buses should provide real value for money	7	6	5	4	3	2	1
Bus routes should not be lengthy	7	6	5	4	3	2	1
Bus stops ought to be conveniently located	7	6	5	4	3	2	1
Response time to resolve complaints should be very low	7	6	5	4	3	2	1
Bus information must be easily available through calls, SMS's & on the Internet	7	6	5	4	3	2	1

Assurance Dimension	Strongly Agree						Strongly Disagree
Drivers & Conductors have to be courteous	7	6	5	4	3	2	1
Buses should provide a lot of safety against crime	7	6	5	4	3	2	1
There should be very little accident damage caused by buses	7	6	5	4	3	2	1
Drivers have to be well trained and safety measures must be taken care of	7	6	5	4	3	2	1
Fire & Emergency Exits must be available on all buses	7	6	5	4	3	2	1

Empathy Dimension	Strongly Agree						Strongly Disagree
Bus should be made user friendly for handicapped	7	6	5	4	3	2	1
Seats must be available for everybody on every bus	7	6	5	4	3	2	1
Buses have to be made safe for young mothers	7	6	5	4	3	2	1
First aid should be available on every bus	7	6	5	4	3	2	1
Destination Displays Systems have to be available on every bus so that it can be useful for visually impaired & aged.	7	6	5	4	3	2	1