

A SURVEY DESIGN TO GRASP AND COMPARE USER'S ATTITUDES ON BUS RAPID TRANSIT (BRT) IN DEVELOPING COUNTRIES*

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1. Introduction

The urban transportation problems in developing countries are generated by certain trends and all of them interrelated. Therefore the solutions which focuses only on individual problems never solve the whole problem in long term, instead the solution needs to be derived from integrated manner. For an example, urban population growth rate is an alarming problem in many developing cities causes more and more transportation facility needs and earns many cars and informal transportation modes on road networks, and, thus, congestion. It dramatically declines travel speed, comfortable, economy, and increases the travel time, environmental problem, etc. this is not a single problem, rather it's a vicious circle of degradation.

Considering these all problems, exist in developing countries, improved public transportation implementation and vehicle screening from the mix environment may be a viable solution for mitigate the problems. But, to date, many hopeful projects proposed or planned are far lacked from implementation stage and failed in many cases due to the dilemma in very fundamental needs of any transportation related projects of demand forecasting. Although data collection and knowing human attitude and behavior is common issue throughout whole world, it is an added serious problem in developing countries due to language, literate, non existence of data framework, and several other cultural and social problems. To date, data collection process not commensurate well to fit to those well sophisticated models developed so far¹⁾.

Poorly maintained and operated public transportation triggered this situation even worse. Coming up with low-cost, higher speed, and reliable public transportation is one of the potential ways to achieve car-free-road. Sustainable public transportation development is an immediate need with the following attractiveness, a quality of life in the city integrating transport and land-use planning, emission reduced vehicle, relieved congestion through high-capacity services, esthetic and secure station/stops, public transport priority, adopting public transport to the customers' needs, giving simple and useful travel information to customers, easy access to public transport with information technology, focusing on the customers through a quality commitment, bringing public transport closer to the customer. There is no single solution suit all cities, different cities looking for different alternatives on this issue. Recent studies and practice in many different cities including developed as well as developing countries proved that improved bus system and switching automobile user to the public transportation is the key solution.

While light rail is also widely popular in many developed cities, it may not becomes practical for all cities in developing countries due to it's high cost of system building and operating. A staged or incremental adjustment towards fixed guide way transit implementation is adding more interest by many agencies today²⁾. Recently, Bus Rapid Transit (BRT) is one of the key interest in mitigating urban public transportation problem of cites in developing countries as a tool which bring all, direct users, non users, operators, planners, policy makers, under the same umbrella and integrating all problem. As the term and service of BRT is very new to many cities in developing countries, implementing such unfamiliar system in those places suffers from answering the question how users' perception would be about BRT.

This study aims to design survey approach using stated preference (SP) to grasp user's attitude on BRT as a new transit service at cities in developing countries and to compare attitudes of different group of users while attempting bias reduction. The Colombo, capital city of Srilanka has been selected as one of the case study area. Survey will be conducted in October and the results will be updated to this article soon after. It is expected that the study will show that SP design works well on elimination of poor image of bus, handles biases tactically when the group is segregated into character-based-branches, and considerably higher percentage of modal switching to BRT observable.

*Keywords: BRT, Developing countries, Survey Design, Stated Preference

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(1) BRT: an overview

Buses, which are the predominant mode of public transportation in most developing countries, suffer from traffic congestion. Rail-based systems are able to avoid congestion, but need a dedicated right-of-way, and have very high construction costs. Light Rail Transit (LRT) may offer an intermediate solution; it is thought by many to be capable of carrying high passenger flows, and to possess an appealing modern image, but there is not always a large difference between LRT and busways in terms of the number of passengers carried on a single corridor. That leads cities to consider bus priority oriented development, and recently spinning with term BRT.

Different organizations defined the system in different way; Federal Transit Administration (FTA) broadly defines BRT as “combining the quality of rail transit and the flexibility of buses. It can operate on exclusive transit ways, HOV lanes, expressways, or ordinary streets. A BRT system combines intelligent transportation systems (ITS), priority for transit, cleaner and quieter vehicles, rapid and convenient fare collection, and integration with land use policy”. Diaz, R. B and Schneck, D. C³⁾ defined BRT as “distinct from conventional bus transit in the way it combines technology, the operating plan, and the customer interface to create higher quality of service to create a focused, high-speed, high-capacity transit service.” Transit Cooperative Research Program (TCRP) defines it as “rubber-tired light rail transit (LRT), but with greater operating flexibility and potentially lower capital and operating costs”⁴⁾.

It is apparent that all definitions are very broad and organization and/or project specific. As the priority measure is a vast set of improvements, BRT system is also defined accordingly. Thus BRT experiences problem in gathering actual demand and passing through project evaluation when it comes to implementation. Fundamentally, BRT is a performance-based service and it's defining characteristics are speed and travel-time savings. It utilizes a combination of advanced technologies, infrastructure, and/or operational investments that provide significantly better service than traditional bus service. It operates at faster speeds, provides greater service reliability, more frequent service, and increased customer convenience. In many cities, where there was no any form of mass transit system exist, marketing and grasping user attitude of a new transit system like BRT is crucial. The authors tried to reduce this burden by categorizing BRT in to three major types as shown in later part of this text in Table1. This categorizing was made by only concerning developing countries.

(2) Issues on implementing BRT

Achieving BRT in those cities have to face and solve numerous issues. Other than high level of political influences and financial burden, obtaining actual users' perception on BRT, as they do not have experience on it, in developing countries is frightening issue for system planners. Specially identified survey related matters are; literacy, Multilanguage, cultural and religious domination, lack of knowledge and concept, etc. To gather information about such unfamiliar system, stated preference (SP) survey method is widely used in transportation field. Designing the survey carefully to grasp users exact attitude with less bias is a critical task for the planners, specially on creating actual image of BRT.

2. BRT: an alternative for developing countries

Unlike developed countries, in developing countries the use of two and three wheeled vehicles, due to higher proportion of medium and low-income user population and its advantage of almost door-to-door service possibility, are high but their advantage of easy maneuverability among traffic mix adds more accident rate. It is the good stand point to keep them using on their own vehicle and attracting to transfer at improved public transportation's stations. This motivation could be one added advantage in developing cities compare to car dependent cities like United States. Thus BRT is a most viable option for developing cities.

Recently there are numerous case studies on BRT elements, characteristics, and existence comparisons. TRB⁴⁾⁻⁵⁾ compared most Latin and north American cities as well some other world wide examples and showed up plenty of advantages gained from BRT; travel time saving, comfortable ride and transfer, single payment, frequent service and less waiting time, unique identity and less complexity.

The most attractive options possessed in BRT for developing cites are less capital and operating cost, allowing staged development of the system, fast implementation, flexible route selection, less additional land acquisition, improving transportation related environmental impact, back born land use development, flexible in selecting and combining elements of BRT to form the best suiting system according to the characters of the city selected, ultimately sustainable effective and efficient transportation to the cities. Developing countries with high transit dependent populations and limited financial resources have increasingly attempted the use of BRT systems⁶⁾.

(1) BRT Promise from Latin American cases

Curitiba, Brazil's amazing BRT system, developed in the 1970s. After a long gap, the new millennium heralded a new era for BRT in various cities all over the world by the success of Quito's Eco-Via and Bogotá's TransMilenio in 2001. TransMilenio is moving over 45,000 pphpdir at speeds around 25 kph, higher than most metro systems. Not only the facilities, but also the contracting agreements, the ticketing systems, and the information systems, are state of the art. After one year of operation, the system boasted a 100% reduction in fatalities from traffic accidents, 43% reduction in sulfur

dioxide emissions, 32% reduction in travel time for users, and an approval rating of 98%. At a ticket cost of only US\$0.40, the system operates at a profit⁷⁾.

Such an outstanding BRT system with well regulatory reform, private-public operation relations and land use planning has been brought to the world by evolving over a period of four decades. Thus the rest of the world acknowledge to the lesson and can emerge in shorter period.

(2) Recent BRT: TransJakarta case

Among many example cities in Asia, now experiencing BRT, TransJakarta system is got focused because of other cities' prior existence of metro type mass rapid transit. It is the first BRT of this region and has been implemented in very short period of eight months, thus lacks from feeder system and carries only about 8000 pphpdir while total bus demand in that corridor was about 12,000 pphpd⁸⁾.

(3) Lesson learnt

Cities in developing countries have learnt lesson from various cities running BRT that well integrated BRT with al most all other modes of transportation and institutional bodies. Few of the concerns are; systems should be designed from their inception to be self financing, setting technical standard on rolling stocks, national public transport and BRT policy, bus priority schemes vs BRT system, BRT and non-motorized vehicle integration, BRT and urban development/land use policy, integration on network/routes, payment, ticketing systems, and pricing, public-private relation, education and training programs for various levels and purposes, and satisfactory survey. For all these policy setting, users' attitude (quality data) is the key. That should be made satisfactorily. Form the past studies, its clear that BRT is not seen and treated according to its specific difference from other alternatives.

3. BRT implementation

Though many of the general problems in conducting transportation survey for the purpose of any system implementation are very common to developed as well developing countries, there are some items specific to developing world; lack of well defined zoning and coding system, data structure, data base, poor management among authorities to centralize the data. To date, the officials do not initiate such data management task due to expensive process, man power, and time consumption. To handle data needs, under such situation, on time and money effective way, researchers often call for SP type survey, specially on new system implementation, here BRT.

Potential pitfalls which researchers need to tackle when undertaking surveys in developing countries are notably the difficulty of obtaining representative samples because of the absence of an adequate sampling frame, the lack of knowledge on the concept of a questionnaire survey by local respondents, suspicion of its legitimacy and purpose, hesitancy to express personal opinions, the inability to answer questions because of the use of unfamiliar concepts and terms in the questionnaire, the difficulty of obtaining linguistic and cultural equivalence of terms and concepts in multi-lingual and multi-cultural surveys, and interviewer bias⁹⁾.

Addition to those, as explained earlier, BRT doesn't have exact definitions due to its pure flexibility in service selection. On the other hand, this make the users more confuse about what is BRT and what type of system they will be provided. To reduce this burden from survey burden, the authors categorized BRT in to three main types according to the elements used. Concerning developing countries and users' needs, implementing full version of BRT at once not always grantee the success. There for best suiting version have to identified by studying the city's characters. In this context, BRT is set to three major hierarchal order according to users' need concerned as shown in Table 1. Its more realistic to say that one selected type may posses more or all attributes of lower type(s) addition to its own.

Table 1: BRT types according to elements adopted

Type 1	Type 2	Type 3
<ul style="list-style-type: none"> ➤ Some means of separation from mix traffic <ul style="list-style-type: none"> • All along or partially • Bus lane, by road marking/ bit raised median ➤ Some means of quick boarding & alighting <ul style="list-style-type: none"> • Pre Collection of fare • Quality, Low floor bus ➤ Unique appearance of bus, Stops, lanes 	<ul style="list-style-type: none"> ➤ Additional Priority measures <ul style="list-style-type: none"> • At at-grade intersection • Passenger information at station and onboard • Modal coordination (Operation & payment) ➤ Feeder system , P&R 	<ul style="list-style-type: none"> ➤ Sophisticated ITS <ul style="list-style-type: none"> • Signal Priority • Vehicle tracking • Real time passenger information • Enables pre-planned trips (web based)

(1) General issues of transportation related survey

Addition to household-based travel surveys, there are many other ways also considered to collect data for transportation planning and decision making process; workplace survey, license-plate survey, driver survey, transit on-board survey, and other types of travel intercept surveys. Apart from which method in use, the state-of-the-art plays important roll in survey design. In urban areas, because of multi cultural and multi language mix of peoples, busy life style and therefore no time to spend on answering questions, existence of more restrictive “privacy legislation”, it become unavoidable to reconsider most elements of conventionally used former questionnaire methods to adopt such peculiar situations. Survey methods in developing countries are far more difficult than elsewhere. Peoples behavior and way of thinking is the main key this issue, beside higher portion of low and medium income population and, due to this factor, more captive population exists. There for marketing become an significant part in introducing a new system in developing countries.

(2) SP survey

Considering above mentioned problems and how to identify users attitude on new BRT implementation is the main task of this study. Among those, some are identified specially for BRT; users had some bad impression on the image of buses, BRT combines a wide range of attributes and tradeoff was more complex, BRT, as its aim to attract all class of users, need careful questionnaire design, etc. The survey has to consider whole expected affecting groups; captive users, choice riders, off-street parkers, existing bus operators, decision makers, and politicians.

The study is decided to conduct in Colombo city, using survey technique of SP with various state-of-the-art; (1)BRT categorization, (2) different target group setting, (3) data collection instrument of drop and pickup questionnaire, face-to-face, and group interviews, (4) BRT Picture illustration with questionnaire, (5) selected corridor, (6) careful questionnaire design to reduce bias, (7) special consideration given to travel time saving, comparable fare, security and safety, and (8) users behavioral reluctant to mix with different income groups.

4. CONCLUSION

From the past studies, BRT has been identified as an extremely promising future for the developing cities. It offers congestion relief and air quality benefits at fraction of the cost of electric rail options. It also can offer all of the amenities of rail, thus helping to attract and retain riders. To ensure its success, all concerned groups has to understand its benefit and be cooperative. At the same time, policies must be implemented to incorporate its success.

During the time of this article writing, the complete results was not drawn and it will be available by September. Therefore the authors are pointing out few expected results from this study. From this study it will be clear that carefully designed SP survey can grasp user information on newly implementing BRT system with reduced bias. It will be clear that SP design worked well on elimination of poor image of bus. SP also will be succeeded in reduction of many bias issues when the group is segregated into character-based-branches. Considerably higher percentage of modal switching to BRT will be observed. The group setting strategy will make the survey more generous to fit different area and according to the group focused comparison results, there is a possibility to setting up a form of standard for guide which type of questionnaire may suite for certain user group and their characters.

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