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User Satisfaction with Transport PPP projects: The Case of the Bangkok Mass Transit System (BTS)

Worapong Tangkitsiri
School of the Built Environment, Heriot-Watt University, Edinburgh, UK
wt89@hw.ac.uk

Stephen O. Ogunlana
School of the Built Environment, Heriot-Watt University, Edinburgh, UK
S.O.Ogunlana@hw.ac.uk

Adekunle S. Oyegoke
School of the Built Environment, Heriot-Watt University, Edinburgh, UK
A.Oyegoke@hw.ac.uk

Michael G. Oladokun
School of the Built Environment, Heriot-Watt University, Edinburgh, UK
mgo5@hw.ac.uk

Abstract
Use of the Build-Operate-Transfer (BOT) approach to infrastructure delivery has become popular since the 1950s and it is currently being utilised in diverse countries as a key concept for Public-Private Partnership (PPP) transportation infrastructure development. In addition, BOT projects have already been completed or are in progress in several developing countries around the world, including Thailand. One such project is the Bangkok Mass Transit System (BTS) SkyTrain, operated by Bangkok Mass Transit System Public Company Limited (BTSC) under a concession agreement with the Bangkok Metropolitan Administration. Due to the commercial nature of infrastructure projects adopting the BOT approach, user satisfaction is a major cause for concern. In order to assess the levels of user satisfaction, it is essential to study the actual benefits being derived by the real users against the levels of their satisfaction.

The focus of this study is to identify and evaluate the benefits associated with a PPP project in Thailand and to develop a model of user satisfaction with PPP by using data from the BTS project. Furthermore, this research examines the satisfaction levels of users and considers how satisfaction may be enhanced before leveraging the model for devising implementable policies on user satisfaction.

Keywords
BTS, Mass Transit, Model, PPP, User satisfaction

1. Introduction

A Public-Private Partnership (PPP) infrastructure development can be defined as: "the permission private sectors acquire from the host government to provide infrastructure services under specific agreement and conditions of market mechanism" (Walker and Smith, 1995). Currently in 2013 the most perceptible type of Public-Private Partnership (PPP) mechanism in transportation infrastructure development is the Build-Operate-Transfer (BOT) method (Walker and Smith, 1995; Dias and Ioannou, 1996; Malini and Raghavendra, 1996; Ogunlana, 1997; Mohamed-Asem *et al*., 2001; Zhang and Kumaraswamy, 2001; Zhang *et al*., 2002; Ghosh and Jintanapakanont, 2004; Zhang, 2005; Abednego and Ogunlana, 2006; ADB, 2008; and World Bank, 2013).

BOT is a concept whereby governments invite the private sector to involve in particular infrastructure projects in the areas of design, construction, finance and the operation of the facility. Eventually, after a concession period, the project will be transferred to the host government (Levy, 1996; and World Bank, 2013).

A key focus of the research is to determine whether the expected satisfaction levels of service users are being achieved and how best to improve the satisfaction of key stakeholders on a PPP project. Consequently, a model addressing the satisfaction of stakeholders is being developed using data from the BTS case study. The model addresses the causes and sources of satisfaction to strategic stakeholders. Data collected through interviews and questionnaire surveys is used to develop dynamic hypotheses in the form of causal loop diagrams. The causal loop diagram will then be used to derive stock and flow diagrams for simulation. The model will be rigorously tested before being used for formulating policies on how best to approach the issue of stakeholder satisfaction.

2. Public-Private Partnership (PPP)

Usually in PPP schemes, feasibility or impact assessment studies are made before construction. However, in some cases, studies can be done on the same projects whilst they are being built to evaluate and determine the effects of or benefits from the projects (Li *et al*., 2005). In order to understand whether the intended benefits of the projects really exist, this research examines the real benefits from a BOT project in Thailand. This will be extremely useful for the policy makers to know if the objectives of completed projects have been achieved and if they can be improved on when undertaking future projects.

According to the World Bank Group (2013), Public-Private Partnership (PPP) is just one name for the involvement of the private sector in the delivery of public services. There are also several other names given to this concept such as Private Sector Participation (PSP) and outsourcing (Dias and Ioannou, 1996; and Liddle, 1997)

For infrastructures, PPPs generally refer to concession or Build-Operate-Transfer (BOT) contracts or any variants of them such as contracts where risks and responsibilities transferred to the private sector are much wider than in traditional public works or service contracts. They usually entail a mix of construction, operation, commercial and financial issues, with a variable degree of risk sharing between public and private partners. A more restrictive definition of PPPs makes reference to the Private Financed Initiative (PFI). One of the main potential benefits of PPPs in infrastructure development is the optimisation of life cycle costs through innovation and adapted design (Li *et al*., 2005).

3. Build-Operate-Transfer (BOT)

BOT is a moderately innovative scheme to infrastructure development. This enables direct private sector investment in large scale projects such as roads, bridges, rails and power plants (UNIDO, 1996). The method of BOT is not complicated:

Build - a private company (or consortium) agrees with a government to invest in a public infrastructure project (such as a road, bridge, etc.). Then, the company secures its own financing to construct the project.

Operate - the private developer then owns, maintains and manages the facility for an agreed concessionary period (e.g. 30 years) and recoups their investment through charges or tolls (e.g. road tolls or train/ rail fares).

Transfer - after the concessionary period the company transfers ownership and operation of the facility to the government or relevant state authority.

The Build-Operate-Transfer (BOT) or Build-Own-Operate (BOO) arrangement is similar to a concession for the provision of bulk services. BOT contracts are normally used for several types of projects, such as road way projects (Euritt *et al*., 1994; and Yang and Meng, 2000) or railway projects (Ghosh and Jintanapakanont, 2004).

In a Build-Operate-Transfer or BOT (and its other variants namely Build-Transfer-Operate (BTO), Build-Rehabilitate-Operate-Transfer (BROT), Build-Lease-Transfer (BLT)) type of arrangement, the concessionaire undertakes investments and operates the facility for a fixed period of time after which the ownership reverts back to the public sector. In this type of arrangement, operating and investment risks can be substantially transferred to the concessionaire. However, in a BOT type of model the government has explicit and implicit contingent liabilities that may arise due to loan guarantees provided and default of a sub-sovereign government and public or private entity on non-guaranteed loans. By retaining ultimate ownership, the government controls policy and can allocate risks to those parties best suited to bear them or remove them (Ye and Tiong, 2003).

4. Customer Satisfaction and User Satisfaction

The definition of "customer satisfaction" is broadly argued as public and private sectors are gradually devoting more effort to value and evaluate it. Customer satisfaction can be experienced in a diversity of circumstances linked to both of "goods" and "services"; which are important, yet goods are not as important as services (Oliver, 2010).

The Oxford Advanced Learner's Dictionary (2013) defines "customer" as "a person or an organisation that buys something from a shop/store or business". In addition, "satisfaction" is the good feeling that you have when you have achieved something or when something that you wanted to happen does happen; something that gives you this feeling. "Customer Satisfaction" is also defined in ISO 9000:2005 as "the customer's perception of the degree to which the customer's requirement have been fulfilled". From this point of view, this research transfers the satisfaction concept from "customer" to "user". In the public sector, the definition of customer/user satisfaction is frequently connected to both of the personal interaction with the service provider and the outcomes experienced by service users (Grenci and Watts, 2007). Moreover, customer/ user satisfaction will start happening when customer user expectations can be met. For example, if an organisation or a service provider supplies customers or users a good level of services higher than their expectations, the organisation or a service provider will meet the customer/user's expectations. Thus, a model can be formulated as in this following equation.

Customer/User Satisfaction = Services – Expectations

Therefore, it is axiomatic that a service provider wishing to satisfy service users must offer services that meets or exceeds the expectations of users. Anything less is likely to lead to dissatisfaction with the service being provided.

5. Case Study on Users' Satisfaction: The Bangkok Mass Transit System (BTS)

The case study for this research is the BTS, SkyTrain project in Bangkok, Thailand (BTSC, 2013). The concession for the BTS was awarded to the Bangkok Mass Transit System Public Company Limited (BTSC) on the 9th April 1992. The BTSC was permitted to retain all revenue deriving from the system operation for 30 years. The project aims are to aid in easing the continual city traffic problems and to provide people around the central business areas in Bangkok with a fast and efficient transportation.

Furthermore, this project tries to uplift the human spirit through physical and psychological health. Figure 1 illustrates the different stakeholders involved in the project. This research, however, focuses on satisfaction of BTS users since they form one of the major stakeholders and are the largest group of people for data collection and analysis on the project.

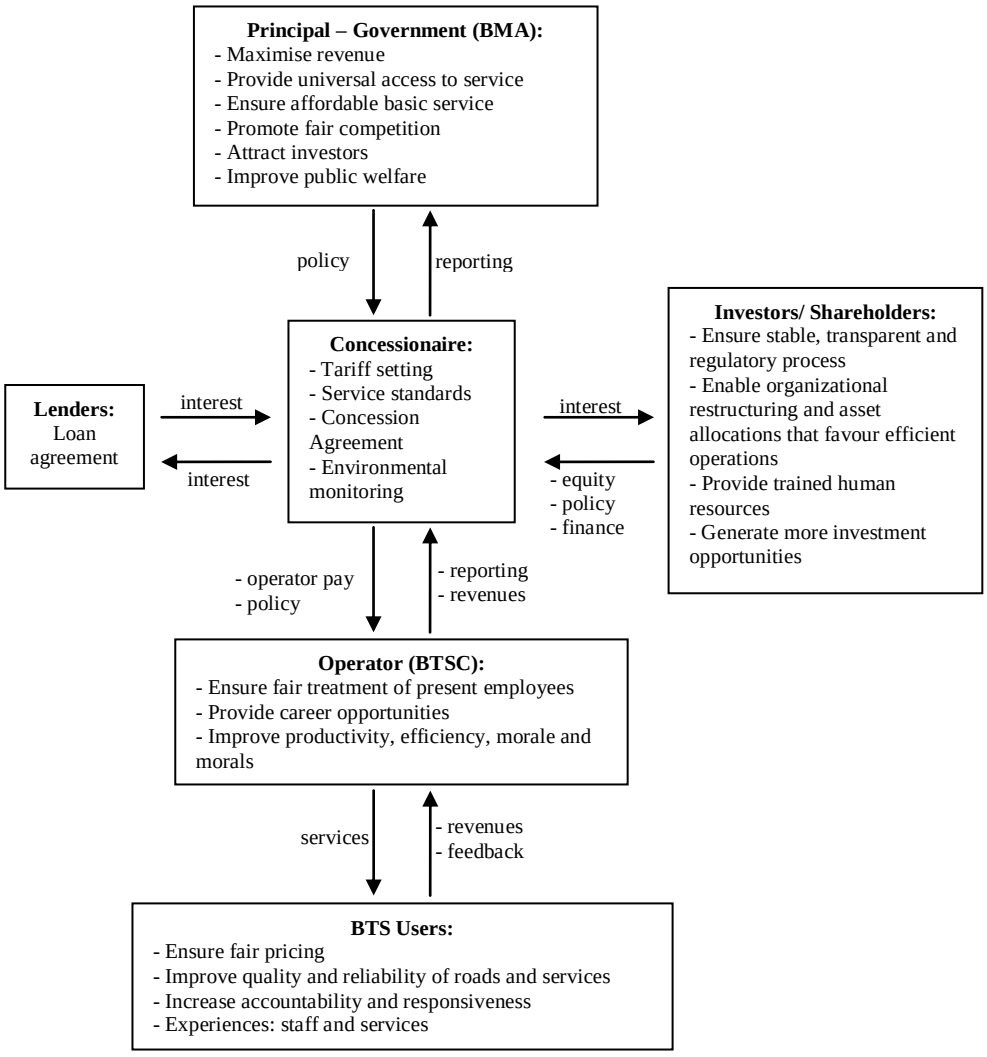

Figure 1: Mapping of BTS Stakeholders with listing of what affects stakeholder satisfaction

Tangkitsiri and Ogunlana (2004) identified important factors such as service, safety and operation factors to evaluate stakeholder satisfaction with the BTS with particular reference to direct-user satisfaction. The study was carried out via questionnaire survey as the primary data gathering approach. The survey of 757 users was conducted and reinforced with interviews with key persons on the project to evaluate the real benefits of the BTS. The results of the survey are displayed in tables 1 through 3. At the time of the survey, it was envisaged that there might be differences between the satisfaction of foreign and local users of the system. Foreign users, who were expected to have experienced other services in different countries, were expected to be more critical in rating their satisfaction with the system. However, the results showed that foreign users have higher means for the rating of their satisfaction than local users. The obvious conclusion from the survey is that most users were satisfied with the system. It did not translate into profit for the promoters of the BTS system, hence the need to find ways to improve user satisfaction and to attract more users to the system.

Table 1: Demographic Profile of Users

			Age in Years				
	Male	Female	< 20	20-30	31-40	41-50	> 50
Thai	198 (32%)	429 (68%)	118 (19%)	399 (64%)	64 (10%)	34 (5%)	12 (2%)
Foreigner	65 (50%)	65 (50%)	7 (5%)	68 (52%)	40 (31%)	13 (10%)	2 (2%)

Adopted from Tangkitsiri and Ogunlana (2004)

Table 2: Satisfaction of Thai Users

Factor	Result						
	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied	Mean	SD
Services	4 (0.6%)	17 (2.7%)	149 (23.7%)	402 (64%)	55 (9%)	3.78	0.66
Safety	1 (0.2%)	10 (1.6%)	146 (23.2%)	404 (64%)	66 (11%)	3.84	0.62
Operation	4 (0.6%)	30 (4.8%)	177 (28.2%)	377 (60.1%)	39 (6.2%)	3.67	0.69
Others (Life improvement)	1 (0.2%)	18 (2.9%)	198 (31.6%)	337 (53.7%)	73 (11.6%)	3.74	0.70

Adopted from Tangkitsiri and Ogunlana (2004)

Table 3: Satisfaction of Foreign Users

Factor	Result						
	Very dissatisfied	Dissatisfied	Average	Satisfied	Very satisfied	Mean	SD
Services	0 (0.0%)	0 (0.0%)	14 (10.8%)	98 (75.4%)	18 (13.8%)	4.03	0.50
Safety	0 (0.0%)	1 (0.8%)	8 (6.2%)	94 (72.3%)	27 (20.8%)	4.13	0.53
Operation	0 (0.0%)	0 (0.0%)	14 (10.8%)	97 (74.6%)	19 (14.6%)	4.04	0.50
Others (Life improvement)	0 (0.0%)	0 (0.0%)	15 (11.5%)	85 (65.4%)	30 (23.1%)	4.12	0.58

Adopted from Tangkitsiri and Ogunlana (2004)

6. Modelling BTS User Satisfaction Employing System Dynamics (SD)

An integration of a System Dynamics (SD) concept and project management implementation can be employed to solve a number of these problems and to analyse the outcomes. An approach to operations and maintenance (O&M) management by employing clear strategic policies will be determined. In particular, the experience from O&M and SD should positively influence decision making design to ensure stakeholders' satisfaction (Sterman, 2000). Therefore, SD is used as both the methodology and tool for the modelling.

As mentioned, SD approach is applied in this study as an effective research instrument in order to generate causal loop diagram (CLD) in readiness for simulation and policy formulation. The causal model of users' satisfaction in this study presents the interrelationships and dependencies among different variables hypothesised to explain users' satisfaction (Figure 2). The model presents some of the system's main feedback loops in users' satisfaction CLD.

It is worth stating that this paper focuses mainly on developing a model based on data from a previous case study (Tangkitsiri and Ogunlana, 2004) and identify different variables from the BTS questionnaire to evaluate and analyse the obvious features of the BTS project based on "service factors", "safety factors" and "operation factors". The CLD is then formed as the significant model for the satisfaction of BTS users who are the largest group of respondents to the survey and having the highest impact on the BTS system. The major loops (Figure 2) are assembled around the major variables of satisfaction within the system; namely (i) city traffic problems, (ii) efficiency of BTS operation, (iii) level of safety, (iv) level of services provided, (v) physical/psychological health, (vi) travel cost and (vii) travel time as this corroborates the work of Che *et al.* (2010). This is the preliminary model that forms the dynamic hypothesis for additional work that is being done on user satisfaction. A new survey has been designed, to be supplemented with interviews with key informants/information gatekeepers on the project. The data gathering exercise will serve to verify that Figure 2 indeed represents the mental model on customer satisfaction agreeable to the system's managers. It will then form the basis of stock and flow diagrams that will be tested and used to reproduce the reference mode provided by data on the system's performance. Once tested and verified against available data, the model will be used to devise policies on user satisfaction.

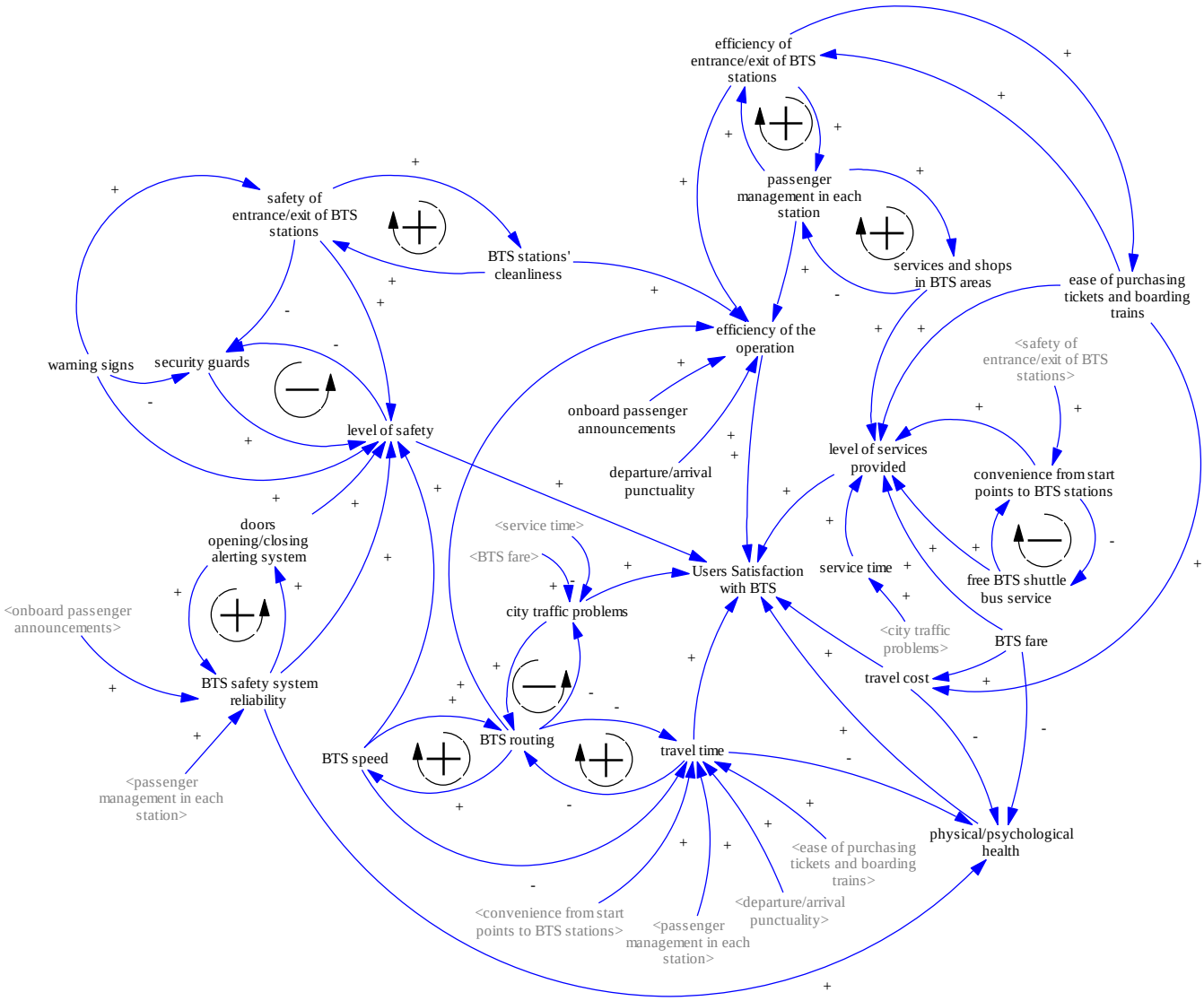

Figure 2: BTS User Satisfaction's Causal Loop Diagram

7. Conclusions

The key purpose of this research is to determine the expected satisfaction levels of service from BTS users who are the largest respondents to this survey. They have impact on the BTS project as a target group. Furthermore, this paper provides the equation connecting customer/user satisfaction to services and expectations. It needs to be stated that the research obtains the conceptual knowledge of customer satisfaction and transfers it to user satisfaction. The users of the BTS system are defined as "customer" for the purpose of the research. Therefore, customer/user satisfaction at the O&M stages of the mass transit system which is a BOT transportation project is addressed.

Also, this study presents the CLD of the BTS user satisfaction being achieved and how best to improve the satisfaction of the user as one of the key stakeholders on a PPP project. Hence, a model addressing the satisfaction of stakeholder is being developed based on literature review and data collected from the

BTS case study. The model gives the causes and sources of satisfaction to strategic stakeholders in the form of CLD in preparation for model simulation and policy formulation. This is still a preliminary phase in studying and developing models of stakeholder satisfaction to locate approaches to manage stakeholder satisfaction through services improvement on the BTS system. It focuses on the model of system's main feedback loops. The next phase of the study is to validate the CLD with the industry practitioners and refine the model accordingly before being transformed into stock and flow diagrams in preparation for dynamic simulation and policy formulation.

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