Environmental and Social Challenges for Bus Rapid Transit (BRT) Peshawar, Using Culture as a Moderator: An Empirical Study in Peshawar Khyber-Pakhtunkhwa

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Abstract

Mass transit systems such as Metro Bus System and Rapid Bus Transit Systems are recently introduced in Pakistan. Although the type of projects can relieve transportation pressure in cities and facilitate the flexible mobility of the citizens, it raises many social and environmental challenges during the construction process. Likewise, culture has a significant role in the successful construction execution in mega mass transit projects because the construction takes place in the heart of the city. Hence, it affects many stakeholders' groups. That is why it is important to determine the impact of key social and environmental challenges and the salient role of culture and conform to the construction of urban mass transit projects to mitigate its negative influence on the stakeholders. Questionnaire is used to collect the data from the stakeholder groups such as merchants, employees, and students. The study analyses the interrelationship of four impact factors, culture (long term orientation), and satisfaction of the stakeholders. The findings of this study assist the decision-makers, contractors, government, planning, and development department to develop more rational construction programs. In the end, future research directions and limitations of the study are reported.

Keywords: environment, culture, Bus Rapid Transit

Introduction

Roads play a vital role in national economic development. Advanced road infrastructure is an indicator of the development of the country. Government focus on introducing road infrastructure development projects to facilitate the mobility of citizens and goods Xue, Zhang, Zhang, Yang & Li (2014). The road development projects are considered very important for the development of underdeveloped countries. Governments aim to play a positive role in the development of new road projects and repair of dilapidated roads (Colombijn, 2002). But the concept of transportation has been evolved recently and the new system for transportation, in order to reduce traffic congestion and enhance flexible mobility, has been introduced. Bus systems that are designed to operate in traffic with priority or with no interaction with traffic at all. These systems focus on the rapidity of the vehicle and thus are named as bus rapid transit (BRT) systems. Bus rapid

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transit (BRT) is currently operating in 165 countries. In 55 countries BRT project is under construction and 121 countries plan to construct in the near future (BRT Centre of Excellence, 2019). Bus rapid transit has a vital role in providing an efficient way to use buses and flexible modes of transportation as compared to conventional bus transit systems and rail transit systems. Along with these benefits, it also provides a sustainable solution to urban mass transit systems (Ahmed & Hameed, 2017).

Mass transit systems are considered large construction project and they have numerous negative social and environmental impacts during the construction phase. It has an unhealthy influence on the daily life of the neighborhood; Construction distress the traffic flow and causes traffic jams and congestions, negatively influences the business activity and becomes the source of inconvenience to the inhabitants. Waste from the construction, noise, and vibration due to the use of heavy machinery in the construction, cause a lot of trouble for the inhabitants to live nearby the project construction sites because the construction takes place at the most important and business cluttered area of the city (L. Wang, Xue, Zhao, & Wang, 2018; Xue et al., 2014; Zhang et al., 2014). Therefore, sustainable construction has become the interest of the researchers globally. Managing these issues during the construction phase needs special consideration of the development agencies.

In Pakistan, BRT systems and Metro bus project are introduced in many big cities like Lahore, Multan, Islamabad-Rawalpindi. Currently, BRT Peshawar is in the construction phase and has been redesigned multiple times and delayed due to various political reasons, design loopholes, and budgetary issues. Due to its construction in the most congested part of the city, it has caused various social, environmental and economic issues for the inhabitants of the city. Previous studies on urban mass transit systems have only examined the social, environmental and economic issues (Wang et al., 2018; Xue et al., 2014; Zhang et al., 2014). However, this study aims to investigate the social and environmental challenges and the moderated role of culture on the construction implementation of BRT Peshawar.

Literature Review

According to the Burtland report, sustainable development refers to "development that meets the needs of the present without compromising the ability of future to meet their needs". Sustainable development is seen from the aspect of the environment, society, and economics.

The underpinning theory for the current research study is Stakeholder Management Theory developed in early (Freeman, 1984). it states that a stakeholder is any group of people of a person who is influence the organizational goals or affected by the organization (Freeman and Reed, 1983). In other words, stakeholder can be any one affected from an organization's operations. Stakeholder gives his/her feedback to the organization as valuable information about how he/she is influenced by the organization (Walker,2000).

Construction of a road involves complex activities such as development, accomplishment and deliver to the related stakeholders. Hence, stakeholders have a deep impact on the road construction project (Wang et al, 2014). There are several key stakeholders such as Government as first and foremost stakeholder which prepare and approved the overall developmental plan (Bllaauw and Premus, 2000). Besides, it develops a congenial atmosphere for the contractor to implement it (Miller and Hobbs, 2005). The atmosphere contains development of specific codes for the contractors and authorities to follow and perform within these codes (Ngowi, 2001). Contractors are desired to perform to cater the community needs and the perform the planning and management tasks of the construction project (Qi et al., 2010).

Environmental Impact

The reason which considered behind the rise of environmental issues is the developmental projects, which are unduly using the natural resources for their construction and as well as building tasks at the cost of polluting the urban environment. For instance, Guggemos and Horvath (2006) and John et al. (2001) found in their research that a serious amount of energy has been consumed by the construction of buildings, additionally producing emission and wastage and the genuine reason behind this was the use of the inefficient methods of construction during the development process. Construction is the reason for fundamental material and energy usage. They demonstrated one of the sixth world freshwater evacuation, one of the fourth wood yield, and two-fifths of material and energy streams (Guggemos & Horvath, 2005). In the US 54% of energy utilization is directly or indirectly related to buildings and their construction and their development.

Environmental Impact Assessment in Pakistan

The Pakistan Environmental Protection Act 1997, under section 12, declare that project proponent, whether related to the public or private sector, is required to prepare an IEE (initial environmental examination), where a project is highly probable to cause disastrous environmental effects, to obtain IEE for appraisal and approval prior to

the construction of the project. IEE is defined as "Initial environmental examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment" (GoP, 1983). The act contains a provision to fine those who bear non-compliance with section 12 or any other specific section or clause or any rule or regulation subsequently of PEPA 1997. These fine vary up to one million rupees and an extra of one hundred thousand during the period of violation and infringement.

Social Aspect

The activities of urban development have long-lasting and broader social impacts. It may influence the community development (more individuals) and group demographics and change the land utilization pattern it may supplant a percentage of the residents close to the construction site furthermore realizes impairment of the community close-by development site.

Communities that reside around development project sites discover themselves subjected to negative effects, for example, disturbances and financial tragedies. This phenomenon is called "social Cost", refer to the loss of salary, loss of delight experienced by gatherings due to the development process. Social costs have several structures that include loss of revenue, expertise and time, usage of non-sustainable resources and also fast deterioration of secondary roads (Allouche et al., 2000). However, it is very difficult to quantify the social costs of the projects because there are several activities undertaken during the execution of the project and it is very difficult to identify the impact of a single activity on a group of people (Çelik et al., 2017).

Cultural Aspect

Barthorpe, Duncan, and Miller (2000) found in their study that over the past 40 years the importance of the term "culture" has been transformed incredibly. Culture is an evolving pluralistic concept, it has many definitions and interpretations. The simplest definition of culture is "incredible structure that unites the society". The modern definition is "socially patterned human thoughts and behavior, which are accepted in society". Fincham (1999) explain culture in its broadest term. His definition with respect to the organization is "the total programming of the mind which perceives the people from one class to another". Culture has a growing tendency to be used in diversified contexts and applications. The relationship between Culture and project has been investigated by researchers and confirmed a significant

relationship between the two variables (Kivrak & Ross, 2009; Naeem, Khanzada, Mubashir & Sohail, 2018). They found that culture and project success are directly related. In order to execute the project successfully, the main issues to be considered are, knowing the culture, respecting the culture and accepting the culture

Long-Term Orientation Index (LTO)

Long-term Orientation is the inverse of Short-Term Orientation. Long-term Orientation remains for the general public which encourages temperance set towards future prizes specifically adjustment, determination, and saving. Short-term orientation remains for the general public which encourages temperance identified with various times specifically respect for agreement, protection of face and sustaining social commitments (Hofstede & Minkov, 2013).

Hofstede and Bond (1988) argue that the following principal derived from Confucian teaching explains the long term orientation:

i. The stability of a society is based on unequal relationships between people
ii. Persistence/ perseverance
iii. Thrift
iv. Having a sense of shame (maintenance of one's dignity)
v. Virtuous behavior towards other

Hofstede and Bond (1988) explain the impact of long-term orientation on economic development and argue that the complementarity and hierarchy of the relationships encourage entrepreneurship. Thrift refers to "saving", which means the availability of funds for reinvestment, hence playing a role in economic development. Persistence/ perseverance leads to commitment towards goal including economic goals regardless of the hurdles and delays.

Stakeholder Management

The origin of stakeholder management literature can be traced back to 1963 when the concept was first introduced in an international memorandum at Stanford Research Institute (Freeman, 1984). The involvement of stakeholders in the process is of paramount importance for facilitating the success of sustainability. The subway construction project comprises various complex activities. Development, execution, and delivery of such projects include a large number of stakeholders. Diverse stakeholders influence the implementation of sustainable construction differently (Wang et al, 2014).

Project Risk Management

Risk is a factor in the construction process whose occurrence often results in uncertainty in the final cost, duration and/or the end quality of the project (Odeyinka, Oladapo, & Akindele, 2006). Management of such risks is concerned with planning, identification, analysis, responses, monitoring and control on a project (PMI, 2013). Valuable information regarding risks like the probability of occurrence, severity and risk ownership is necessary at this stage. The quantitative risk analysis involves the creation of a model that represents the project being studied and general uncertainties. Limited availability of information greatly undermines the risk management techniques, which are often dependent on the stage the project is in (Szymanski, 2017).

Project Success Criteria

Success criteria and success factors are distinct from one another, as both appear often in literature. Criteria are the measures that describe the failure or success of projects (Cooke-Davis, 2002). In the early years of project management, projects were considered successful if they were delivered on time, within budget and satisfied the predetermined quality measures (Morris, Pinto, & Söderlund, 2010). However, Wit (1988) showed that such measures alone are not sufficient enough to determine a project's success.

The case of BRT Peshawar

Bus Rapid Transit (BRT) initialized construction on 29th October 2017, a combined venture of the Asian Development Bank and Government of Khyber-Pakhtunkhwa. The initial budget of the project was calculated to be 68.9 billion rupees; however, the cost of the project has been alleviated due to the delays in the project completion and exchange rate. The system is 29 kilometers long, including 4 kilometers of elevated section and 3 elevated stations, while 3.5 kilometers of the system will include underpasses. The project was planned to be completed in three phases. Phase-1 includes Chamkani to Balahisar Fort, phase-2 includes Balahisar Fort to Aman chowk and Phase-3 includes Aman Chowk to Karkhano Market. The project has a total of 31 stations. Each station will be located approximately 850 meters from the previous station and will take 2 mins of travel between the two stations. The project is planned to have 255 air-conditioned buses. Out of 255, 155 will be 12-meter-long buses while the rest of them will be 18 meters long. The project will carry 0.5 million travelers on a daily basis.

Based on the above literature review the following hypotheses are developed

H1: There is a relationship between the impact on commute out and

the satisfaction of a community.
H2: There is a relationship between the impact of transportation and the satisfaction of a community.
H 3: There is a relationship between the impact on the environment and the satisfaction of a community.
H4: There is a relationship between the impact on living and the satisfaction of a community.
H5: Long term orientation moderates the relationship between commute out and the satisfaction of a community.
H6: Long term orientation moderates the relationship between transportation and the satisfaction of a community.
H7: Long term orientation moderates the relationship between environment and the satisfaction of a community.
H8: Long term orientation moderates the relationship between the living conditions and the satisfaction of a community.

Theoretical Framework

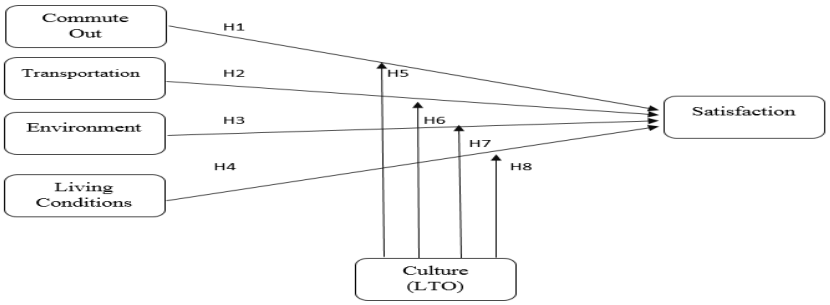

Figure 1: Source: Xue et al., 2014

Methodology

This is a quantitative research study. The study has used a deductive approach. The study has been categorized as a deductive study. The deductive approach is explained as a study in which the researcher starts from a broader and general idea and move towards a narrow and specific and precise viewpoint (Collis & Hussey, 2009). The questionnaire in this study is adapted from (Xue et al., 2014) and (Hofstede & Bond, 1988). Xue et al. (2014) investigated social and environmental challenges for the Harbin subway project in china. Hence, the questionnaire remains relevant to this study while Hofstede and Bond (1988) explained the principle of Long-Term Orientation derived from Confucian Dynamism, which is one of the six dimensions of culture and is used as a moderated variable in this study. The questionnaire has closed-ended structure questions with a five-point Likert scale ranging from 1-strongly disagree, 2- disagree, 3- neutral, 4- agree, and 5- strongly agree. While the last variable of the second section has

close-ended structured questionnaires with a five-point Likert scale ranging from 1- highly unsatisfied, 2-unsatisfied, 3-neutral, 4- satisfied, and 5-highly satisfied. In this study, non-probability snowball sampling is used. Taherdoost (2018) argue that nonprobability sample is used when exhaustive population lists are not available, some units are unable to be selected and there is no way of knowing the size and effect of sampling error. The study is targeted towards merchants, employees, students and self-employed Green, (1991) proposed a formula for a minimum number of subjects for testing the beta weights for statistical significance, the formula is illustrated as follow:

$$N \geq 104+m$$

N represents the number of subjects while m represents the number of predictors or independent variables. For our study, the minimum number of subjects should be 108. However, data is collected from 188 subjects to better represent the population.

Data Collection

Description		**Percentage**
Gender	Male	76.1
	Female	22.9
Age	Less or equal to 18	2.1
	18-24	42.0
	25-40	51.6
	41-50	3.7
	50 or above	.5
Education	High School and Below	3.2
	Undergraduate	42.6
	Masters and Above	54.3
Profession	Student	47.9
	Employed	31.9
	Self-Employed	15.4
	Retired	.5
	Other	4.3
Distance b/w home and destination	100m	6.9
	100–500m	10.6
	500–1000m	14.9
	1000–1500m	13.8
	More than 1500m	53.7
Major travel method	Bus	17.0
	Taxi	31.9
	Car	42.6
	Cycling	3.2
	Walk	5.3

Are There Elders/Seniors or children in your family	Yes	93.1
	No	6.9

Table 1 shows the demographic data of the respondents. The participants can be classified by gender, age, occupation, and travel method. Data shows that the sample fairly represents the target population. So that the reliability of the finding and conclusion can be guaranteed.

Analysis

Data Analysis and Findings

Table 2 Reliability Statistics

es	ype	of items	nbach's alpha
ıte Out	IV	04	.803
ɔrtation	IV	04	.817
ıment	IV	03	.725
Conditions	IV	03	.800
erm Orientation	MV	06	.759
:tion	DV	06	.876
	-	26	.840

V=Independent Variable MV= Moderated Variable DV= Dependent Variable

Table 2 shows the individual and overall reliability of the questionnaire.

Table 3 Correlations

No.	Variables	1	2	3	4	5
1	CO	-				
2	TI	.910** .000				
3	EI	.864** .000	.863** .000			
4	LCI	.868** .000	.862** .000	.862** .000		
5	LTO	.902** .000	.925** .000	.895** .000	.876** .000	
6	SATIS	-.857** .000	-.855** .000	-.855** .000	-.846** .000	-.880** .000

Table 3 shows that commute out (r=.902, p<.001), transportation impact (r=.925, p<.001), environmental impact (r=.895, p<.001), and living condition impact (r=.876, p<.001) are positively related to each other. However, satisfaction (r=-.857, -.855, -.855, -.846, -.880, P<.001) are negatively related to the dependent and moderating variable respectively. Hence, Hypothesis H1, H2, H3, H4 are accepted.

Table 1 Coefficients and Regression Analysis

Model	Beta	Adjusted R^2	T	Sig.
CO	-.220		-2.506	.013
TI	-.219	.802	-2.533	.012
EI	-.290		-3.887	.000
LCI	-.216		-2.869	.005

a. Dependent Variable: SATIS

Table 4 shows commute out (β=-.220, p<.05) transportation impact (β=-.219, p<.05), environmental impact (β=-.290, p<.05), living condition impact (β=-.216, p<.05) decreases the mean value of satisfaction and overall model fit is R^2.

Table 5 Moderated Regression Analysis for Commute Out and Satisfaction, Moderate Long Term Orientation

Model	Adjusted R^2	Beta	T	Sig.
CO	.894	-1.099	-4.017	.000
LTO		-.744	-2.946	.004
Interaction Term One CO*LTO		2.693	5.446	.000

a. Dependent Variable: SATIS

Table 5 shows that interaction term one (β=2.693, p<.05) brings a positive increase in the mean value of satisfaction. The overall model fit is R^2=.80 hence, H5 is accepted. Table 6 shows interaction term two (β=2.340, p<.05) and the overall model fit is R^2=.808. Therefore, H7 is accepted. Table 8 presents interaction term three (β=3.381, p<.05) and the model fit are R^2=.808. That is why H7 is accepted. The results in table 9 indicate the interaction term four (β=2.267, p<.05) and the overall model fit are R^2=.818. Hence, H8 is accepted.

Table 6 Moderated Regression Analysis for Transportation Impact and Satisfaction, Moderate Long-Term Orientation

Model	Adjusted R^2	Beta	T	Sig.
TI	.808	-.983	-3.380	.001
LTO		-.496	-2.917	.049
Interaction Term Two TI*LTO		2.340	4.556	.000

a. Dependent Variable: SATIS

Table 7 Moderated Regression Analysis for Environmental Impact and Satisfaction, Moderate Long-Term Orientation

Model	Adjusted R^2	Beta	T	Sig.
EI	.836	-1.306	-5.096	.000
LTO		-1.245	-4.409	.000
Interaction Term Three EI*LTO		3.381	6.644	.000

a. Dependent Variable: SATIS

Table 2 Moderated Regression Analysis for Impact on Living Condition and Satisfaction, Moderate Long-Term Orientation

Model	Adjusted R^2	Beta	T	Sig.
LCI	.818	-.916	-3.225	.001
LTO		-.501	-2.968	.045
Interaction Term Four LCI*LTO		2.267	4.472	.000

a. Dependent Variable: SATIS

Finding and Discussion

The construction of mass transit systems has a negative impact on stakeholders. Due to this, there is a need for systematic re-planning of alternative routes, traffic, and transportation to mitigate the impact. Proper Noise and dust control mechanisms should be devised along with proper waste management. Therefore, it is a challenge for the government department to make an effective solution to reduce the impact. The results from the survey show that due to BRT construction, the cost and time in public transportation are increased. Road conditions cause damage to vehicles, parking is a serious issue. Living conditions have worsened, ecological life and air quality have depreciated. Hence, stakeholder confronts enormous social and environmental challenges in terms of commute out, transportation, living conditions and environment. These findings correspond to the findings of (Xue et al., 2014).

The findings reveal that culture (LTO) moderates the impact of social and environmental challenges due to BRT construction. The results thus indicate that the coefficient of the interaction term is positively associated with the satisfaction of the stakeholders. Those with a culture, which score high on the Long-Term Orientation index, take a more pragmatic approach. They encourage thrift and effort in modern technology as a way for the future. Stakeholders are willing to cooperate and facilitate the construction phase of the BRT project and endure the challenges such as challenges faced in commute out,

transportation, living condition, and the environment. Because the project will facilitate the lives of the stakeholder in the future.

Urban mass transit systems are recently introduced in big cities of Pakistan. Mega construction projects have social and environmental ramifications. Thus it is necessary for the decision-makers to identify these issues and promptly address these issues. However, these issues can not be eliminated completely from mega construction projects due to its size and the number of stakeholders involved in it. To moderate the negative effect of these challenges, culture is an important aspect to consider. Once the culture of the area is known, the project is communicated to the stakeholders in the context of culture. Clearly understanding the culture and the proper explanation of the project in the context of culture inculcates acceptability towards the project and tolerance towards the social and environmental challenges. The findings can be used by the decision-makers, contractors, and government departments for the deployment of mass transit systems in other regions. This research goes further by considering these aspects in the context of culture. Research of this nature has seldom been carried out and hence entails the novelty of the research. Therefore, presented as novel research contributes to the knowledge.

Conclusion and Recomandation

The research aims to investigate the impact of In conclusion, the researcher believes that the four principal impact factors need a keen consideration of decision-makers when taking relevant measures to reduce the negative impact of the construction of mass transit systems. However, the results identify that cultural factor is positively associated with the satisfaction of stakeholders and moderate the impact of social and environmental challenges. To obtain public understanding and support for a construction project in order to create a harmonious society, the citizens should be kept informed and involved to mobilize their enthusiasm to support the cause. Hence, culture is one of the important element in the planning of mass transit systems.

The study can be replicated in other cities of Pakistan where the government plan to construct mass transit projects. In this study two factors of sustainability have been considered, other researchers can focus on the economic perspective of the mass transit project as well. This study used only one dimension of the six dimensions of the culture due to its high index in KP. In future studies, other dimensions of the culture can be used as a moderated variable where it has a high index as mentioned by (Shah & Amjad, 2011).

The study has few limitations as well, hence. The finding from this study should be used with caution. This study employs a cross-sectional survey method and self-reported data collection, consequently, it leads to shortcomings. The first one is social desirability bias. Second, questions tend to examine the attitude of the respondents and fail to measure the real behavior in most cases. These issues can be redeemed by employing mixed methodologies in research studies. Another limitation of the study is the sample size. Since the size of the population is unknown, the sample size could not completely reflect the response of the population. Besides, instead of cross-sectional data the future researchers should use longitudinal data.

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