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Using the Theory of Planned Behavior to Identify the Behavioral Intention to use Public Transportation Service: The Case Study of Karachi Circular Railway

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ABSTRACT: All public transport systems aim to provide riders with a suitable alternative to driving, and the demand for public transport rises each year. This paper explores behavioral intentions to use public transport, specifically the Karachi Circular Railway, utilizing the Theory of Planned Behaviour (TPB). A questionnaire survey was performed based on the TPB model to classify variables that influence users' intentions to use the Karachi Circular Railway. At Karachi Circular stations, 240 questionnaires were distributed to the users of KCR for the data collection. A simple frequency distribution analysis was used to determine demographic characteristics and variables that influence users. For the relationship and predictions between the TPB components, the correlation and linear regression analysis were used in Statistical Package for Social Sciences (SPSS) 23. The findings of the analysis demonstrate that, as opposed to the SN and PBC, users' attitudes with 0.163 towards public transportation are the most influential factors in their intention to use the Karachi Circular Railway. The majority of respondents agreed that they prefer KCR because it saves money and provides satisfactory service, a comfortable and friendly environment. This research is first kind of study conducted on KCR and on mass transit system. This research can be extended in the future as part of the Karachi Circular Railway's strategic sustainable transportation system.

Keywords: Behavior Intention, Theory of Planned Behavior, Karachi Circular Railway, Simple Frequency Distribution Analysis, Correlation, linear Regression.

Abbreviations: *TPB, Theory of Planned Behavior; SN, Subjective Norm, PBC, and Perceived behavioral Control.*

I. INTRODUCTION

Asian countries are booming economically, leading to substantial increases in travel demand for long-spreads [1]. The rising quality of life in urban areas is being paralleled by an increase in driving trips and the number of automobiles [2]. Recent statistics show that car ownership's growth rate in some emerging Asian cities is considerably higher than in developed Asian states with similar per capita earnings [1]. In Karachi, many households' activity habits include using a private car for daily mode choice [3]. Families drive to various destinations, including jobs, shopping, public facilities, and recreational activities [4]. The majority of people now rely heavily on automobile travel [5].

On the other hand, this move toward driving for the personal journey has led to traffic congestion, emissions, and global warming [2]. Such negative consequences jeopardize society's quality of life and mobility [6]. It is critical for public participation in the democratic process to develop a long-term solution to climate change that allows changes in attitudes and lifestyles [7, 8]. As a result, planners in developing Asian countries must manage private transportation modes to promote expanded and extensive public transport use [1]. This can take the form of TDM or mobility management (MM), both tactics that change passengers' behavior [9].

Every public transportation system's fundamental goal is to provide commuters (users of public transport), particularly drivers, the people who choose to use private cars, with a viable alternative to avoid using them [10]. A commonly observed trend was that the need for public transport grew steadily over time. It has become a must in the increasingly congested metropolitan centers due to traffic congestion and since people no longer choose to own cars [11]. Due to the rise in fuel prices, the Pakistani government encourages public transport as a decrease in traffic, lower accident incidence, and the benefits it brings to individuals as a decrease in flow [2].

In the last few decades, Karachi's transportation problems have been exacerbated. A rise in air and noise, along with decreased air quality, cause an increase in respiratory breathing issues and environmental issues caused by traffic congestion [12]. People's livelihoods have also deteriorated, becoming more limited to avoid long journeys and where they work; this has led to a decline in income and personal security, hitting the most vulnerable, especially women [13]. Karachi's urban transportation system is mainly road-based, with the Karachi Circular Railway (KCR) serving only a minor role after it ceased operations in 1999 due to heavy losses [14]. The KCR has recently reopened in part, but the percentage of journeys has not been updated.

Furthermore, Karachi has a 7400-kilometer road network with a surface area density of 207 kilometers per 100 square kilometers [15]. The city's public

transportation chaos has worsened dramatically over the years. If one considers the large number and amount of newspaper coverage, it has become the most pressing issue confronting by Karachi residents [16]. Karachi had a very efficient public transportation system, with urban-suburban railway service via the Karachi Circular Railway; about 6 million passengers use it each year [13]. The service began to deteriorate in the mid-'80s due to a lack of rolling stock repair and replacement and track and station construction. The service was halted in December 1999, and in March 2005, an attempt was made to restart it [13].

Pakistan Railways has partially reopened the Karachi Circular Railway from Pipri Station to Orangi Station on Monday, November 16. According to a Pakistan Railway press release, the route distance between Pipri and Orangi Station is approximately 60 kilometers [17]. Karachi, car, and informal public transportation have become the most popular modes of transportation and access from one location to another for people. Most of Karachi's citizens use informal public transit regularly to get from residence to school, college, university, and work. Commuters are shifting their mode of transport from informal public transportation to formal public transit in the Karachi Circular Railway due to its revival. Perceived quality is how much the passengers see the service, such as how quickly they go from point A to point B and find it. These two factors significantly impact a user's intention to use public transportation services [18].

As a result, this research aims to identify the factors that influence commuters' behavior intention to use Karachi Circular Railway in the Karachi metropolitan area and determine the most influential factor using the Theory of Planned Behavior (TPB). This research focused on public transport, notably the Karachi Circular Railway and its routes from Karachi City Station to Orangi Town. Furthermore, this research was performed in KCR stations in a random manner. City Station to Orangi Town is the preferred travel path for the questionnaire survey.

II.THEORY OF PLANNED BEHAVIOR (TPB)

The TPB was created by Ajzen (1985) to describe or quantify how human acts are driven. Individuals' action is logical and motivation-based, according to this theory. The Theory of Planned Behavior develops from the Theory of Reasoned Action [18]. In explaining an individual's actions, this theory considers both volitional and non-volitional regulations. It forecasts a specific action's occurrence, assuming that the behavior is intentional [19].

The TPB makes three rational inferences about intention. The focus is primarily on behavior and attitudes, SN, and PBC [20]. In transportation and environmental psychology, the TPB can be used [21]. The TPB effectively described the psychological reasons for taking public transportation [22]. Eriksson and Forward [23] examined the psychological predictors of driving, bus riding, and bicycle riding. They discovered that behaviors, subjective norms, and perceived behavioral control explained between 38% and 48% of the difference in intention to use various types of transportation. Perceived behavioral control and attitude are essential considerations in all situations [24, 25].

TPB was used as a model in several studies such as weight loss, voting decisions, smoking abstinence, transportation, social sciences, and traffic violations have all been successfully predicted and explained using the TPB [24]. Furthermore, the TPB was used to investigate U-pass programs' efficacy in Canada [18, 26]. Research on the Mass Rapid Transit System in Taiwan [27]demonstrates passengers' activities by developing a systematic model that considers transit use, service efficiency, perceived value, satisfaction, and behavioral intentions. In Vietnam, researchers examined behavioral intentions to take the bus by considering perceived bus service effectiveness, perceived problem understanding, and moral responsibility [28]. Others concerned with road safety in Malaysia concentrate on motorcycles and helmets [29].

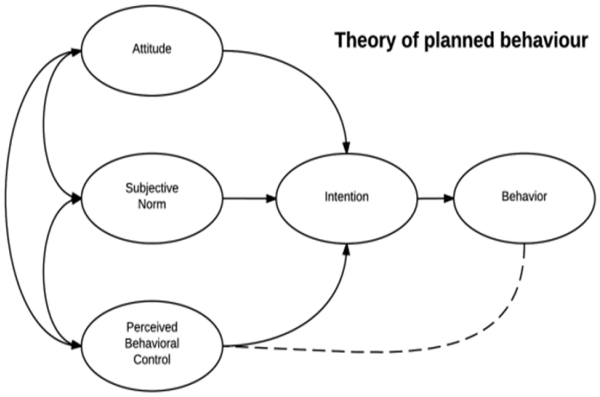

Fig. 1. Theoretical Model of TPB.

III. MATERIALS AND METHODS

A. Measure of constructs

The scales used to measure the TPB model's original constructs were developed using a 5 point scale (semantic differential) with the given anchors: (good: bad, unpleasant: pleasant, and negative: positive) [21, 28]. The questionnaire also included questions about respondents' demographic characteristics.

B. Sample and Data Collection

For this research, the questionnaire is used as the research instrument for the analysis. The questionnaire was created using the Theory of Planned Behavior as a guide (TPB) and divided into two parts; the first section contains an overview of the respondents' demographic characteristics or facts. The second section discusses behavioral intentions to use public transportation services utilizing the Theory of Planned Behavior as a guide. The analysis was conducted at the Karachi Circular Railway's City Station to Orangi Town stations. This route was chosen because the government planned to begin the KCR service on this route during the initial process and pass through residential, commercial, and industrial areas. Cronbach's alpha values are used as a benchmark for evaluating the internal accuracy questionnaire items' reliability [10, 30]. Questionnaires were distributed to the Karachi Circular railway users at selected railway stations along between City Station and Orangi Town station. Respondents were chosen randomly based on their gender, age, level

of education, and purpose and frequency of public transportation use during a given week. According to [31], any multivariate statistical analysis should begin with a sample size of 200; therefore, 240 respondents were chosen for the data collection of this research.

C. Data Analysis

This report's findings were analyzed using the Statistical Package for Social Science (SPSS) version 23. The study's objectives and the relationship between variables were accomplished using descriptive statistics, correlation, and regression analysis. Cronbach's Alpha was used to assess measurement reliability by evaluating the reliability of each factor's variables. Coefficients greater than 0.7 are considered sufficient, implying a reasonable degree of construct reliability [32].

IV.RESULTS AND DISCUSSION

A. Residents' Demographic Analysis

The descriptive review in Table 1 includes information about the respondent's gender, age, level of education, occupation, monthly income, the reason for using public transportation, and frequency of use of public transportation per week. Male respondents, at 52%, outnumbered female respondents, at 48%. The majority of respondents, 60%, were between 18 and 30, and 46% had a bachelor's degree. The majority of respondents had a monthly income of between 30,001 and 40,000 PKR. Additionally, it demonstrates that respondents are still seeking education and earn less than 20,000 PKR. Karachi is a strategic location with numerous educational institutes. This means that most public transportation users are students and private workers with a low income and a maximum age of 30. Additionally, the study found that the primary reason for using Karachi Circular Railway was for schooling and a private job. The frequency of using public transportation was between one and five days per week.

B. Multivariate analysis of the TPB components

Table 2 summarizesthe mean scores and standard deviations for the users' various aspects of using KCR. Respondents give their feedback on several aspects such as service satisfaction, the environment of KCR, comfort, time punctuality, good seating places. The respondents were encouraged to use KCR due to its superior service (Mean= 3.53, std. deviation= 1.18), followed by the environment (Mean= 3.41, std. deviation= 1.27), comfort of the service (Mean= 3.40, std. deviation= 1.18), and the time punctuality (Mean= 3.41, std. deviation= 1.27). Additionally, users revealed that it is more affordable and cost-effective to ride than informal public transportation and private vehicles in the Karachi metropolitan area. Significant improvements, such as the addition of park and ride facilities at stations, will significantly increase transit usage and draw many discretionary riders who would otherwise travel by car.

According to Table 3, the relationship between intention and behavior was moderately high positive, with r= .703 and p<.01. Though attitude, SN, PBC, and behavior all exhibit a moderately positive relationship (r = .682, .621, .486, and p .01, respectively), this indicates that all TPB components have been shown to substantially contribute to the behavioral intention towards using the Karachi Circular Railway. Although the relation between intention and behavior exhibits a high degree of significance, as the three primary components are attitude, SN, and PBC. According to [33], the intention is significantly more correlated with behavior followed by behavior with attitude. According to a 2016 study [18], there is a strong positive association between helmet use intentions and behavior.

Table 1: Respondents' demographic characteristics.

Profile	Category	Percentage (%)
Gender	Male	52
	Female	48
Age Groups	18-30 years	60
	31-45 years	31
	46-65 years	7
	66 or above	2
Education Level	Primary	6
	Secondary	2
	Higher Secondary	15
	Graduate	46
	Post-Graduate/PhD	31
Marital Status	Single	77
	Married	27
Year of Residence	1-2 years	44
	3-5 years	13
	6-7 years	9
	More than 7 years	34
Monthly Income	Less than 20,000	32
	20,001-30,000	15
	30,001-40,000	35
	40,001 or above	19
Purpose of Using Public Transport	Work	36
	Daily Routine	10
	Education	46
	Entertainment	8
Frequency of Using Public Transport	1-5 times	65
	6-10 times	27
	More than 11 times	8

Table 2: Mean score and standard deviation of factors that influenced the users.

S. No	Item	Mean	Std Deviation
1	Service Satisfaction of KCR	3.53	1.18
2	Environment of KCR	3.41	1.27
3	The comfort of using the KCR	3.40	1.18
4	KCR adheres to time punctuality	2.46	0.87
5	Usage of KCR facilitates users	3.21	0.81

Table 3: Correlations of TPB components.

	ATT	SN	PBC	INTT	BEH
ATT	1				
SN	.643**	1			
PBC	.522**	.661**	1		
INTT	.613**	.587**	.493**	1	
BEH	.682**	.621**	.486**	.703**	1
**: Correlation is significant at the 0.01 level (2-tailed)					

Two-level regression analyses are performed on the TPB model. At first, multiple linear regression analysis was used to investigate the association between the TPB components. Second, a simple linear regression analysis was performed between the variables of behavior and intention. Table 4 demonstrates the importance of attitude, SN, and PBC coefficients on multiple linear regression analysis. Both TPB component values were statistically significant. The findings suggest that attitude and SN components are essential predictors of behavioral intention to use Karachi Circular Railway (β=0.163 and β=0.129, respectively, $p<0.05$). However, for PBC, the sequence of outcomes was not the same. According to some research, attitudes and behavioral intentions have a reasonably close correlation [18, 26]. Additionally, the R2 (0.550) value shows that the model accounts for 55% of the variables' variance.

Table 4: Regression Analysis of the TPB Components

Model		Standardized Coefficients	t	Sig (2-tailed)
		ß		
1	Constant		-3.891	0.000
	Attitude	0.163	3.170	0.002
	SN	0.129	2.402	0.017
	PBC	0.097	2.084	0.038
Dependent variable: Intention R= 0.742, R2= 0.550, Adjusted R2= 0.545, Std. Error of the estimate= 0.947				

The product of simple linear regression analysis is seen in Table 5. The values have been determined to be statistically significant. There is a significant relationship between intention (β=.703, $p<.05$) and behavior variables. Additionally, the study demonstrates that behavior can justify the coefficients of determination, R2= 0.494, 49.4% of intention variance. According to some researches [18, 33], the intention is significantly more correlated with behavior than attitude. In contrast to the assertion made by [29], service efficiency and perceived meaning directly affect behavioral intention Passive systems are based on renewable energy sources.

Table 5: Regression analysis of the Intention and Behavior Components.

Model		Standardized Coefficients	t	Sig
		ß		
1	Constant		.135	.893
	Intention	.703	19.351	.000
Dependent variable: Behavior R= 0.703, R2= 0.494, Adjusted R2= 0.493, Std. Error of the estimate= 1.000				

V. CONCLUSION

In the study area, public transit modes include public buses, commuter rail, and taxis. This research aims to identify the behavioral intention to use Karachi Circular Railway using the Theory of Planned Behavior. The factors that inspired users to use the KCR service are determined utilizing simple frequency distribution analysis of demographic and experience data described in the form of a mean score and standard deviation. The uppermost mean score contributes and influences commuters to use Karachi Circular Railway over private and informal public transportation in Karachi. Apart from that, user satisfaction with the service, the environment, the comfort, and the facilities offered by the KCR providers all affect users' intention to use the service.

In contrast, the lowest mean score defined as a factor in using KCR can reduce regular trips for different purposes such as education, work, recreation, etc. TPB components were analyzed using correlation and regression analysis. The findings indicate that three significant TPB variables affect public transportation users' decision to use KCR. These variables are Attitude, Perceived Behavioral Control, and Intention. Cheaper fares and improved infrastructure are two factors that encourage public transportation users to use KCR. It can be inferred that a favorable attitude toward cost savings, service satisfaction, convenience, and the atmosphere would increase ridership on public transport.

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