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Investigating the Customer Satisfaction of the Bus Service in Qatar

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Abstract

The city of Doha is witnessing a rapid growth in population; resulting in traffic congestion and stress on the city's infrastructure. One of the main challenges in the city is to attract more users to the only public bus service available since 2004. This paper investigates the quality of service and passenger's perception regarding many factors including comfort, convenience, safety, and cleanliness. Data was collected through administered questionnaires to investigate the quality of the existing service and the future of bus service in Qatar. To gain further investigation regarding the factors significantly affected the commuters' satisfaction; Structural Equation Modeling (SEM) approach was developed. Finally, recommendations that aim to maximize the use of bus service as public transportation in the city of Doha were suggested. The findings help to understand the shortcomings of the existing public bus service and provide the responsible authorities with suggestions that can enhance the quality of service and attract more users to the public bus service.

1. Introduction

According to the Qatar census 2010, Qatar's population has reached 1.7 million and is expected to reach 2.0 million in 2015 with a constant annual growth rate of 3.97% and about 3.2 million people, more than double, by 2030. Over the past few years, more job opportunities have been created, and expatriates from all over the world were invited to work and live in the country. As a result, people living and working in the city of Doha, the capital, became car dependent (1). Qatar today is facing a rapid growing economy, activities, population, and

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hence a growing demand for transport where the need for safe mobility, accessibility for business, and low negative impacts of transport on social, natural, and the built environment is needed (2).

To accommodate the high demand for more public transportation, there is a need to establish attractive, safe, and highly sophisticated public transportation system within Qatar. The public transportation system must attract sufficient commuters from individuals who have the option of traveling by car, rather than regular transit users who will use the system but will not affect the traffic congestion on the roadway network. Users who use personal vehicles on a daily basis are more likely to switch from personal vehicles and choose transit if the public transportation will provide a faster, less stressful, and/or cheaper trip than the personal car. If the users are able to combine more than case from the above-listed cases, the possibility of switching to transit will dramatically increase. The more drivers switching to transit, the more benefit to traffic congestion. Therefore, transit service quality is an aspect markedly influencing travel user choices. Customers who have a pleasant experience with transit will probably use transit services again, while customers who experience problems with transit may not use transit services the next time (3). The purpose of this paper is to determine the quality of the existing bus service in Qatar and to provide recommendations that aim to maximize the use of Qatar's public bus in the future.

2. Background

Redman et al (4) studied the quality of service attributed that would encourage modal shift from private vehicles to public transportation. Using a qualitative systematic review, it was concluded that while service reliability and frequency are important attributes in general, those attributes most effective in attracting car users are largely effective and connected to individual perceptions, motivations and contexts. Reduced fare promotions and other habit-interrupting transport policy measures can succeed in encouraging car users to try public transportation initially. Attributes such as accessibility, reliability and mobility provision, perceived by the target market as an important service attributes, must then be provided in sustaining the switch from car use after promotional tactics have expired.

Tyrinopoulos and Antoniou (5) studied level of satisfaction from public transit services in five transit systems in the two major cities in Greece, Athens and Thessaloniki. The five transport companies operate three different means of transport (bus, trolley bus and rail/metro). The results demonstrated that a well-coordinated and well-structured transportation environment should be the primary aim of the policy makers in Athens, followed by other quality attributes such as service frequency, waiting time, accessibility, and vehicle cleanliness. Ali (6) in a study to assess the quality of intra-urban bus services revealed that the quality of bus service was different in different parts of the city based the variation of waiting time, walking distance to the nearest bus stops, and bus service frequency varied from one center to another. Andreassen (7) studied the quality and customers' satisfaction of three transportation modes: bus, train, and tram. A questionnaire reflecting the different satisfaction variables was developed, ranging from very little satisfied to very satisfied. Each item in the scales contains questions with six intervals anchored "very little satisfied" to "very satisfied". Based on the analysis, recommendations to make improvements in traveling time (users of tram and train); price level (users of train); and physical design/layout of station/platform (users of buses) were made.

Reliability of commuting times is essential as unpredictability in journey length has been demonstrated to correlate positively with subjective and objective stress-related measures in commuters (8). Schaller (9), in a research that studied commuters decision to choose one of six modes (subway, bus, auto, taxi, and car service) in New York city, studied six major factors, from how long the trip will take to availability of parking. Travelers choose the mode that presents the least difficulty for a particular type of trip. The survey results showed that the areas of subway service improvement with the greatest potential ridership payoff are reducing how long it takes to make a trip, increasing the availability or ease of use of transit, and making traveling on the subway a more comfortable and relaxing experience. Two external factors, parking availability and taxi fares, were also found to significantly impact subway ridership. Cantwell et al. (10) found that commuters who travel on a crowded public

transport experience higher levels of commuting stress, probably due to increased invasion of personal space and cramped, uncomfortable conditions. High stress levels are also more prolific among respondents who commute using unreliable public transport services, most likely induced by a lack of control over the situation. Commuters who spend longer times waiting for a public transport service also tend to be more stressed. Long wait times are most likely caused by services not running according to schedule, which, in turn, induces stress due to lack of reliability and a diminished sense of control. O'Regan and Buckley (11) found similar results as they indicated that insufficient capacity and crowding are the major causes of stress among commuters who use public transport.

3. An Overview of the Bus Service in Doha

By the early seventies, the beginnings of the Qatar's modern engineering had put in place a radial ring road pattern in Doha to accommodate the increasing numbers, character and requirements of motor vehicles (12). As the city developed, the distances to be travelled and the numbers of people to travel increased. However, development brought the constraints associated with time and convenience. The construction industry resolved its transportation problems by using lorries and pick-ups for moving their workers around while smaller numbers of people were taken in taxis. Public transportation in Doha, Qatar emerged in 2004 (13) when the company Mowasalat introduced the beginnings of the national bus system for use by the public. Originally operated on restricted routes, the system had slowly expanded in an attempt to reduce the number of vehicles moving in Doha (14). Major improvement to the bus system occurred during the preparations of the Asian Games in 2006. The public bus system became the official transportation mode for the major event. A major Central Bus station (Old Al Ghanim) was introduced. The station allotted 8,000 Square meters involving shaded waiting areas, water coolers and refreshment stalls. In 2007, the Mowasalat introduced the main plan for the bus service. It initially considered that all buses routes will serve a minimum walking distance of 700 to 800 meters long from each serving location. Area's demand was taken into consideration regarding bus stops allocations. However, several planned services were neither implemented nor utilized (15).

To ensure a high quality service, bus technical maintenance is routinely done after the bus has run for at least 5000 kilometers. Mowasalat has its own driving training center to train drivers and use sophisticated software to provide live coverage of the bus movement, location, and schedule. In addition, the software can track the drivers' performance including speeding, aggressive driving. The system is also linked to the new ticketing system known as Karwa Smart Card that was introduced in the market in August 2012 (16). Karwa Smartcard is a disposable card that users can purchase and recharge. The card is available in three versions: Karwa Smartcard Classic, which uses the check-in/check-out system that calculates the least possible amount based on the actual travel distance; the Karwa Smartcard 24 Limited, which is valid within 24 hours upon its first use in the bus and can be used up to 2 times (single tap) within Greater Doha; and the 24 Unlimited card which is also valid within 24 hours upon its first use and is virtually a (single tap) ride-all-you-can, anywhere card. The cards are sold for 30 Qatari Riyals (QR), which is equivalent to $8.2 each at all locations where the Karwa Bus network routes run. Bus trip cost ranges from a minimum of 2.50 QR ($0.68) and a maximum of 9 QR ($2.47) for long trips extending to the metropolitan Doha's boarders. For bus routes within Greater Doha, trips are scheduled every 15 minutes; yet, trip duration varies. Rush hours throughout the day in Doha cannot be determined due to current road works and construction across the city. Nevertheless, congestion is likely to occur between 6:00-9:00 am, after school hours around 3:00 pm and at night 5:00-8:00 pm.

4. Data Collection

Research data was obtained through administered questionnaire/survey to get users' feedback on the quality of the service. Questions included users general information, other modes of transportation they use, and their perceptions regarding the quality of Doha bus service. The researchers had chosen Old Al Ghanim Bus Station

(main bus station for the service) to run the administered questionnaire/survey. The station serves bus routes numbers 11, 33, and 76, three of the busiest routes in Doha. Bus number 33 travels through Salwa Road, bus number 76 travels through the city center, and bus number 11 travels to the old airport. Departing from Mowasalat Headquarter at 3:20 am returning back at 11:20 pm, each route is assigned four trips per day.

Mail-in questionnaires, phone interviews, and internet-based surveys were not considered since it would be difficult to provide a representative sample of the population at large resulting from many population segments not using the service. Thus, it was decided to use only handout questionnaires for this study. In this approach, 500 survey forms were printed and distributed randomly among bus users at the Old-Al Ghanim bus station. These forms were handed out randomly in several locations covering the three routes served by the main station. The researchers explained the questionnaires to the people in person then asked them to complete them by hand and return them to the researchers there itself. All 500 distributed survey forms were collected. However, only 278 surveys forms were considered complete and used in the analysis. The remaining forms had more than 30% missing responses (questions) and hence they were disregarded.

5. Analysis

Table 1 highlights the characteristics of the users. The number of male and female respondents was 236 and 42 respectively. It should be noted that 85% of the respondents are male. As can be seen a large gap in nationality between respondents. This rate was 75.5% in Asian and 15.8% in Arab. 39.2% aged between 16-30 years old. 49.3% aged between 31-45, 9% aged 46-60, and only 2.5% aged more than 60 old. 55.04% versus 44.96% of the sample is married and have families. In terms of income level, 73.4 % of these users receive less than 5,000 QR monthly. However, bus users were recorded to be approximately 91.7% residents in Qatar. Only 8.3% were of visitors' status. Obviously, 67% of the respondents cannot afford to own car. The questionnaire statistics show that 67.3% of the sample respondents do not own private vehicles. Approximately 53% of the sample respondents use the bus service around 1-7 times per week. 60% would not use the bus service if they can afford to own a private car. 71% of the respondents stated that the bus station is about 10-20 minutes walking distance away from their residence. Only 10% stated that they often carpool to reach the nearest bus station. Moreover, half of the sample stated that they often waited 30 minutes to catch a bus and that the travel time to their desired destinations usually took an additional 30 minutes.

Table 1. Characteristics of the Survey's Participants

Variables	Categories	Number of Respondents	Percentages of Respondents
Gender	Male	236	84.89
	Female	42	15.11
Age	Less than 30	109	39.21
	31 -45	137	49.28
	46 – 60	25	8.99
	60 and above	7	2.52
Nationality	Arab Non-Qatari	44	15.83
	Asian	210	75.54
	Other	24	8.63
Status in Qatar	Resident	255	91.73
	Visitor	23	8.27
Marital Status	Married	153	55.04
	Single	125	44.96
Occupation	Student	7	2.52
	Employed	263	94.60

	Unemployed	8	2.88
Income	Less than 5,000 QR	204	73.38
	5,000 – 10.000 QR	66	23.74
	More than 10,000 QR	8	2.88
Own a car	Yes	91	32.73
	No	187	67.27
Reasons for using the bus	Not familiar with the road network	11	3.96
	Faster mode of travel	3	1.08
	Cannot drive	21	7.55
	Do not own a vehicle	166	59.71
	Parking is difficult	9	3.24
	Less expensive mode	68	24.46
Trips per week	1 – 3	67	24.10
	4 – 7	81	29.14
	8 – 11	45	16.19
	12 – 15	20	7.19
	More than 15	65	23.38

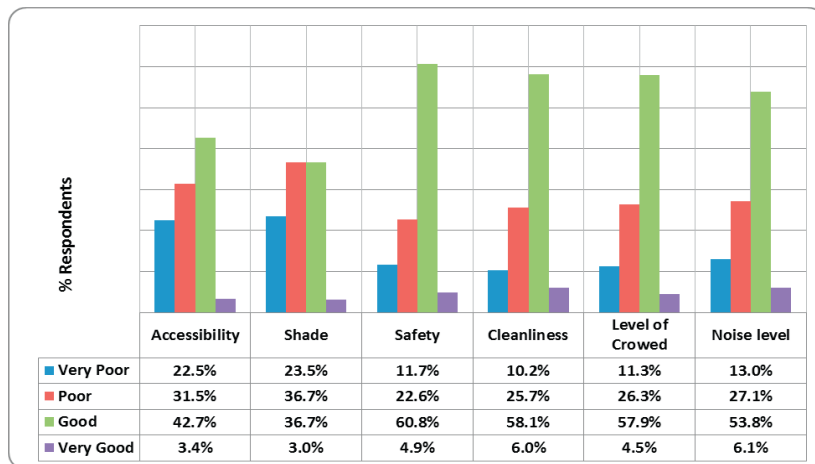|	Accessibility	Shade	Safety	Cleanliness	Level of Crowed	Noise level
Very Poor	22.5%	23.5%	11.7%	10.2%	11.3%	13.0%
Poor	31.5%	36.7%	22.6%	25.7%	26.3%	27.1%
Good	42.7%	36.7%	60.8%	58.1%	57.9%	53.8%
Very Good	3.4%	3.0%	4.9%	6.0%	4.5%	6.1%

Fig. 1. Users Satisfaction with the Bus Stations

54% of the respondents claimed that the stations are in poor conditions. Almost half of the respondents claimed poor accessibility to bus stations. 60% claimed poor shading stations and inconvenient support to local crucial weather conditions. Almost 60% of the respondents rated safety, levels of noise and crowd, and cleanliness in the stations as good (Figure 1). In responding to their satisfaction with the overall quality of the bus, almost 66% showed satisfaction with bus safety, cleanliness, and cost. However, punctuality and frequency were critically emphasized as inadequate (Figure 2). Respondents showed general satisfaction with bus drivers' knowledge of direction, respect of road laws, appearance, level of welcoming, and invasion of privacy.

Some open ended questions were directed to all interviewed users viewing their visions on enhancing the service considering their demands and personal comfort. Users mostly recommended constructing new shaded-climate controlled stations/shelters with enough seats to accommodate at least 10 customers at any time of the day especially in busy areas. Users also highlighted the importance of designating seats for female passengers in all buses. Users also recommended that the number of buses on busy routes should be increased. Offering common services such as toilets and praying areas for both genders close to bus stations/shelters were also pointed out. On

the other hand, more educated passengers highlighted the importance of developing public awareness to inform users of the importance of using the city's public bus service.

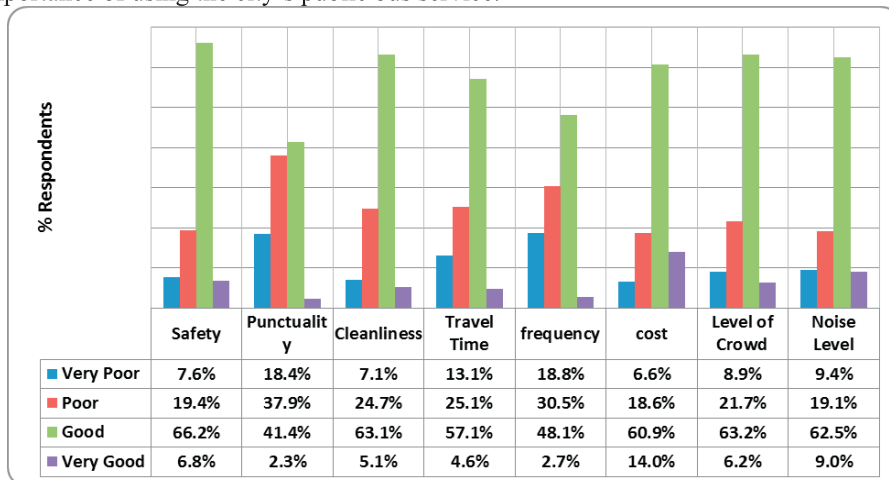|	Safety	Punctuality	Cleanliness	Travel Time	frequency	cost	Level of Crowd	Noise Level
■ Very Poor	7.6%	18.4%	7.1%	13.1%	18.8%	6.6%	8.9%	9.4%
■ Poor	19.4%	37.9%	24.7%	25.1%	30.5%	18.6%	21.7%	19.1%
■ Good	66.2%	41.4%	63.1%	57.1%	48.1%	60.9%	63.2%	62.5%
■ Very Good	6.8%	2.3%	5.1%	4.6%	2.7%	14.0%	6.2%	9.0%

Fig. 2. Users Satisfaction with the Bus Service

According to the survey results, it was found that the bus system in Doha mainly, if not completely, serve the expatriate community but not to nationals. The nationals use small buses that are institution based and personal vehicles for most of their trips. When asked, a typical commuter in Doha would be willing to pay half hourly wage to avoid an hour on the bus. Based on the survey results, service improvements that decrease walking and waiting time will result increase in ridership. The passengers were more sensitive to changes in time cost rather than changes in fares, which is confirmed by O'Sullivan (*18*). The passengers noted that the bus service was not very reliable; yet, affordable and clean. It should be noted that 75.5% of bus users are Asian employed males between sixteen and forty five years old. They typically spend one quarter of their salaries on transportation. Not surprisingly, female commuters in Qatar do not use the service. It also seems that school children do not use public buses in general. Children go to and from schools mainly using private cars, taxis, and buses.

6. Structural Equation Modeling

Structural equation modeling (SEM) was used to study the complex relationships among variables. SEM is a very general, chiefly linear, chiefly cross-sectional statistical modeling technique. Factor analysis, path analysis, and regression all represent special cases of SEM. SEM is a largely confirmatory, rather than exploratory, technique. That is, a researcher are more likely to use SEM to determine whether a certain model is valid., rather than using SEM to "find" a suitable model although SEM analyses often involve a certain exploratory element.

A structural equation model implies a structure of the covariance matrix of the measures (hence an alternative name for this field, "analysis of covariance structures"). Once the model's parameters have been estimated, the resulting model-implied covariance matrix can then be compared to an empirical or data-based covariance matrix. If the two matrices are consistent with one another, then the structural equation model can be considered a plausible explanation for relations between the measures. Compared to regression and factor analysis, SEM is a relatively young field. As such, the methodology is still developing, and even fundamental concepts are subject to challenge and revision. This rapid change is a source of excitement for some researchers and a source of frustration for others. The basic equation of the latent variable model is the following (19)

$$Y=BY+AX+\epsilon \tag{1}$$

Where:

$Y(y\_i)$ is an $(m,1)$ vector of the endogenous latent variables

$X(x\_i)$ is an $(n,1)$ vector of the exogenous latent variables

$\varepsilon(\varepsilon\_i)$ is an $(m,1)$ vector of random variables

B and A matrices are the structural coefficients of the model

Observing the results of estimation, it was found that for the explanatory variables, only three variables are significant: status in Qatar, number of trips per week by bus, and the level of waiting time. These three variables affect the level of satisfaction of the buses users. For the endogenous latent variables, there are three classes of variable on the level of satisfaction in the station, bus and driver behavior. For the station, all the latent variables except accessibility have a major effect on customer satisfaction for the station. These variable include shade, safety, cleanliness, crowd level and Noise Level, which have a value respectively 0.92, 1.00, 0.97, 1.01 and 1.09 (i.e., the variable has a main effect when the value of the parameter is very close to unity). For the bus service, punctuality, travel time, frequency, and ticket cost have a major effect on the customer satisfaction of the bus services, especially the punctuality and the time of the trip with a value 1.03 and 1.19 respectively. For the driver behavior, respecting traffic laws, drive appearance, welcoming, and privacy invasion have a major impact on the customer satisfaction of the driver behavior. The variable have values of 0.99, 1.03, 0.97 and 0.77 respectively.

Table 2. SEM Model Estimates

Model Estimates	Parameter Estimate	Standard Error	T Statistic	[2]Prob. Level
(x)-1->[Gender]	0,003	0,024	0,127	0,899
(x)-2->[Age]	0,076	0,047	1,613	0,107
(x)-3->[Marital Status]	0,014	0,033	0,432	0,666
(x)-4->[Nationality]	0,024	0,032	0,754	0,451
(x)-5->[Status in Qatar]	-0,040	0,018	-2,225	0,026
(x)-6->[Occupation]	-0,073	0,066	-1,112	0,266
(x)-7->[Income]	-0,019	0,034	-0,549	0,583
(x)-8->[Own car]	-0,044	0,031	-1,425	0,154
(x)-9->[Trips/week]	0,331	0,097	3,424	0,001
(x)-10->[Waiting time]	0,191	0,060	3,209	0,001
e1	0,129	0,011	11,768	0,000
e2	0,515	0,044	11,742	0,000
e3	0,248	0,021	11,767	0,000
e4	0,240	0,020	11,763	0,000
e5	0,075	0,006	11,718	0,000
e6	0,998	0,085	11,756	0,000
e7	0,266	0,023	11,766	0,000
e8	0,219	0,019	11,748	0,000
e9	2,106	0,181	11,647	0,000
e10	0,804	0,069	11,662	0,000
(station)-->[Accessibility]	0,405	0,039	10,269	0,000
(station)-23->[Shade]	0,926	0,107	8,622	0,000
(station)-24->[Safety]	1,009	0,101	10,006	0,000
(station)-25->[Cleanliness]	0,975	0,196	4,968	0,000
(station)-26->[Crowd Level]	1,015	0,101	10,071	0,000
(station)-27->[Noise Level]	1,090	0,203	5,378	0,000
(bus)-->[Safety]	0,300	0,030	9,936	0,000
(bus)-28->[Punctuality]	1,034	0,120	8,590	0,000

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[2] Red values: Statistically significant at a level of 5%

Black values: Not Statistically significant at a level of 5%

Model Estimates	Parameter Estimate	Standard Error	T Statistic	[2]Prob. Level
(bus)-29->[Cleanliness]	0,001	0,221	0,006	0,995
(bus)-30->[Travel Time]	1,190	0,122	9,731	0,000
(bus)-31->[Frequency]	0,924	0,121	7,615	0,000
(bus)-32->[Fare cost]	0,907	0,111	8,153	0,000
(bus)-33->[Noise Level]	-0,237	0,226	-1,047	0,295
(driver)-->[Know directions]	0,353	0,033	10,611	0,000
(driver)-34->[Respect traffic laws]	0,994	0,086	11,499	0,000
(driver)-35->[Appearance]	1,038	0,078	13,239	0,000
(driver)-36->[Welcoming]	0,977	0,078	12,557	0,000
(driver)-37->[Privacyinvasion]	0,777	0,068	11,476	0,000
err1	0,116	0,026	4,426	0,000
err2	0,000	0,000		
err3	0,201	0,033	6,119	0,000
(x)-->(station)	0,425	0,046	9,244	0,000
(x)-->(bus)	0,459	0,040	11,486	0,000
(x)-->(driver)	0,390	0,043	9,037	0,000

In the proposed structural equation model, there are two types of variables: endogenous and exogenous latent variables. The variable model relates the 11 exogenous variables to endogenous latent variables, named station satisfaction, bus satisfaction and driver behavior satisfaction. For each variable, there was an error term to insert in the model to test the correlations between residues in order to validate the model. Figure 3 shows the final structure of the model.

7. Conclusions and Recommendations

A significant challenge facing the infrastructure planning in Qatar is the increase in population. As the country is going through a considerable development phase and constructing many mega projects, companies tend to recruit massive amount of the labor force for these projects. Thus, accelerating the population rate, has a major effect on the existing road network. For instance, roads are going through serious traffic jams throughout the day. This study had identified the key issues facing the local public buses as an important mode of transportation. In order to encourage public transportation and public buses in particular to support the national vision 2030, public buses need to improve to compete with other modes of travel such as private cars and taxis. It will be fascinating to see how the bus system develops bearing in mind that it is cutting into the taxi operators' revenues, which, they feel, are not that impressive at the best of times. Emphasis on punctuality and following bus time schedule is one of the main issues that users mainly face.

It was found that the main category of users that use the service is the low-income category. This situation has created a poor local image of the service and driven other population categories away from using the service. Not surprisingly, female commuters in Qatar do not use the service. In addition, It also seems that school children do not use public buses in general. Children go to and from schools mainly using private cars, taxis, and buses. According to the survey results, it was also found that the bus system in Doha mainly, if not completely, serve the expatriate community but not to nationals. The nationals use special buses that are institution based and personal vehicles for most of their trips. Users argued that the bus company in Doha should introduce a new typology of public buses in order to encourage people of other social classes to use the bus.

Public bus users do not regard the existing public bus transportation services satisfactory. The passengers noted that the bus service was not very reliable; yet, affordable and clean. When asked, a typical commuter in Doha would be willing to pay half hourly wage to avoid an hour on the bus. Based on the survey results, service improvements that decrease walking and waiting time will result increase in ridership. Users recommended providing separate female waiting areas, prayer areas, and toilets at all main stations. Buses are timed to run at thirty minute intervals, requiring passengers to wait under the hot sun much longer than taxis.
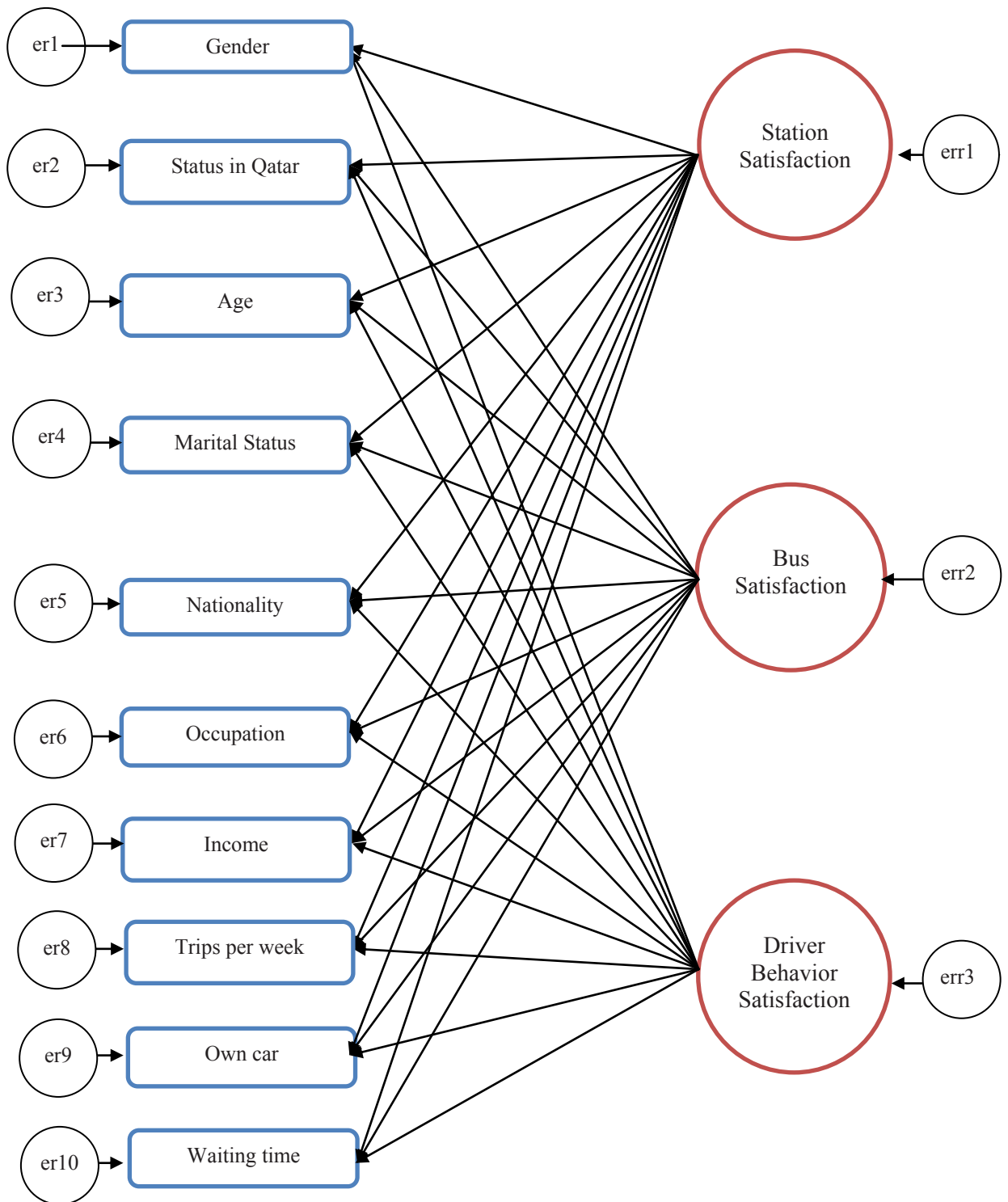
Fig. 3. Path diagram - Final Structure of the Model

Climate controlled shaded waiting areas and sufficient services at all bus stations and shelters for both drivers and users are necessary to improve the service. Transport planning in Qatar requires high coordination among local authorities and involved agencies in order to maintain better service. The bus company should not be the solely responsible entity for public transportation in Doha. Other agencies such as the Municipality of Urban Planning and Ashghal to provide other types of improvements such as separate bus lanes and/or preemption at signalized intersection. Future studies should focus on studying the reasons why women do not use the offered services. Marketing and advertising programs should also be initiated to encourage people to utilize the public bus service.

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