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**Potential Impacts of Introducing Public
Transport and Travel Strategies in Riyadh City,
Saudi Arabia**

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Potential Impacts of Introducing Public Transport and Travel Strategies in Riyadh City, Saudi Arabia

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Abstract

City authorities in developing countries now pay increasing attention to sustainable transport systems by enhancing or introducing public transit services. An example is Riyadh City in Saudi Arabia, which has witnessed a significant growth of car ownership and population. Current efforts to reduce the excess dependence on private cars involve the construction of six metro lines integrated with a bus network. Against this background, this paper investigates the expected effects of the new public transport system and related interventions on Riyadh City, focusing on urban form, economic factors, environment, social norms and culture. The analysis is based on interviews conducted with transport experts and officials of relevant authorities in Riyadh City. The study results show that the private car as the dominant travel mode has promoted dramatic growth in car ownership and city sprawl. Also, results highlight that the city's urban form would have the highest impact on the uptake of public transport, especially the population density. Moreover, it is felt that the provision of public transport services in Riyadh would improve mobility, decrease travel time, and create more employment opportunities, positively affecting Riyadh City's economy and improving the environment. Interviewees expected that these potential interventions would affect social norms and culture in the long term.

Keywords: Riyadh Public Transport, Social Norms and Culture, Travel Strategies, Urban Form.

Introduction

Public transport is a shared passenger travel service to gain access for people and goods in urban settings, with attractive features such as quality of services and reliability (Rode et al. 2014). Investment in public transport services is a compulsory quality leap for more liveable and accessible cities (Hatwar and Gajghate 2014). Many cities, particularly in developing countries, still face unaffordable challenges in urban mobility systems (Amin et al. 2013).

Saudi Arabia is one of middle east countries that covers the largest portion of the Arabian Peninsula (see Figure 1 and 2) (ADA 2013). The development of cities in Saudi Arabia follow closely the urbanisation of cities in North America, with decentralised jobs and homes which lead to commuting growth and increased car ownership (Aldalbahi and Walker 2015). Riyadh City as the capital of Saudi Arabia has witnessed one of the highest growths in population and car ownership in the world (Aldalbahi and Walker 2015). Over the last 50 years, and as a result of the oil boom, the majority of Saudi Arabian cities have dramatically urbanised. Riyadh City in particular, has developed from a walled town in 1972 into a metropolis of almost six million people (Mubarak 2004; Aldalbahi and Walker 2016). The fast growth and irregular development of Riyadh City has resulted in negative consequences such as high reliance on automobiles, congestion, car accidents, poor air quality, and an unfriendly pedestrian environment (ADA 2013; Alharbi et al. 2015). Saudi Arabia has limited experience in providing any kind of public transport, with the only case being the Saudi Public Transport Company, which ceased operation in 1992 (Al-Dubikhi 2007; Alqahtani et al. 2012).

Riyadh City is wealthy, sprawling and the society is deeply affected by Islamic culture and many conventions regarding privacy (Aldalbahi and Walker 2016). There are also demographic issues corresponding to high average household size (Abdul Salam 2013), and women are forbidden from driving (Al-Dubikhi 2007). All women and young children rely on males, private drivers or taxis to meet their daily transport needs including travel for education, jobs, shopping trips or other social life (Aldalbahi and Walker 2015).

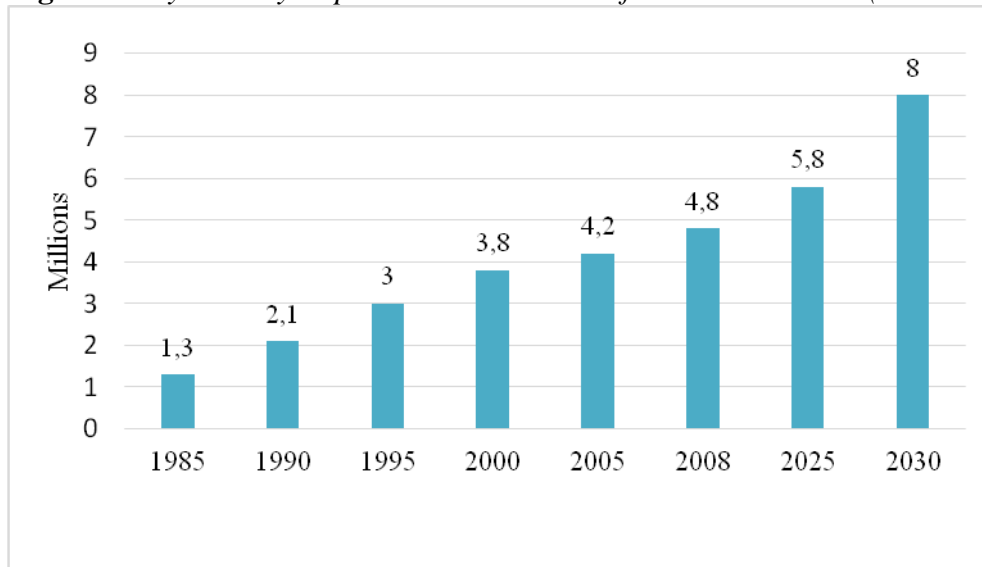
Since the last decade, planners and decision makers from Ar Riyadh Development Authority (ADA) and other related city authorities have seriously considered introducing an alternative to the private car in an effort to reduce automobile dependency (ADA 2013). In April 2012, plans to develop a new Riyadh Public Transport Project (RPTP) were approved (ADA 2013). The proposed RPTP consisting of six inter-connecting metro lines linked with a bus network is under construction and expected to be operational by 2018 (ADA 2013).

Therefore, this study followed a qualitative approach to explore the possible impacts of introducing a new public transport system and implementing effective interventions on Riyadh City urban form, economics, environment, social norms and culture.

Figure 1. Saudi Arabia, Area: 2.15 million km², Population: 28.83 million (ADA 2013)



Figure 2. Riyadh City Population Growth Rate from 1985 to 2030 (ADA 2014)



Impacts of Investment on Public Transport Systems

Most studies of public transport impacts on cities focused on heavy rail systems and the recent generation of rail systems built in US cities over the past half-century (Cervero and Kang 2011). Weisbrod et al. (2014) review

some advantages of investing in public transport for the urban form, economics and environment of urban areas. They state that public transport improves mobility, reduces congestion and carbon emissions, and improves air quality. Public transport would also mix land use, enable economic growth and improve property values, generate jobs and support public policies regarding energy use (Litman 2015).

Urban form has been identified as a crucial dimension of sustainable cities (Creutzig 2014). Many studies confirm the response of urban form to transport improvements in general and public transport in particular (Cervero and Kang 2011; Creutzig 2014). Cervero and Seskin (1995) argue that there is a simultaneous interaction and influence between public transport and urban form such as land use and density. For example, Washington D.C. has experienced substantial rail-induced land-use impacts around Metrorail stations when the density in the areas of the stations rose from 17% to 23% prior to and after the opening of the Metrorail. Over the last decade, land prices increased by around 100% several years after services began (Cervero and Seskin 1995). Cervero and Kang (2011) argue that a range of impacts associated with the opening of new rail services on city forms, such as increased residential and commercial property values, density, and land use have also been found in studies of San Francisco's Bay Area Rapid Transit, Chicago's Midway Line, and in Seoul's new subway line.

From an economic perspective, Aschauer and Campbell (1991) indicate that public transport concentrates economic activity and generates high productivity and economic growth. Banister and Berechman (2001) have developed a new approach referring to the benefits of economic development and ways of measuring investment in transport infrastructure. A recent study conducted by Weisbrod et al. (2014) assesses the economic impacts of investing in public transport in American communities. Their study maintains that in addition to city mobility and expansion of services, sustainable public transport can potentially affect the economy by saving costs of travel and vehicle ownership. Those switching from private car use experience savings in use of public transport, while there are reduced congestion costs for business and households, and enhanced city business growth. Litman (2015) argues that public transport would support city economy through providing more jobs and local business activity, increase income and property values, increase productivity by improving access to education and jobs, and save expenditure associated with accidents and pollution.

The role of public transport for more sustainable environments in urban areas has also been examined. Zavitsas et al. (2010) study reveals that the concern of cities with environmental and sustainability issues related to transport emissions and noise are increasing. Many authors comment that the annual increase in private car ownership is a threat to the human environment (Gärling and Schuitema 2007; Bamberg et al. 2011). An efficient public transport system could be a major solution for reducing travel time, congestion and improving air quality (Zavitsas et al. 2010). For decades, urban transport policy has been a vexed issue worldwide. As a result, Australia and other

governments have (allegedly) promoted some alternatives in an attempt to reduce the problems of environmentally unsustainable travel (Mees 2000).

It is a challenge to overturn the influence of social norms and culture shaped by decades of car travel to promote public transit use (Brown et al. 2016). More understanding of current and desirable behaviour, selecting potential measures, and evaluation of results are essential steps to reshaping social norms (Boschetti et al. 2014). Beirão and Cabral (2007) raise the need to classify the main social or culture barriers that prevent the use of public transport as a major step to remove them. They add that people are unlikely to switch from current travel modes unless they perceive public transport as a viable alternative for them.

Methods

Participants' Characteristics and Interview Procedure

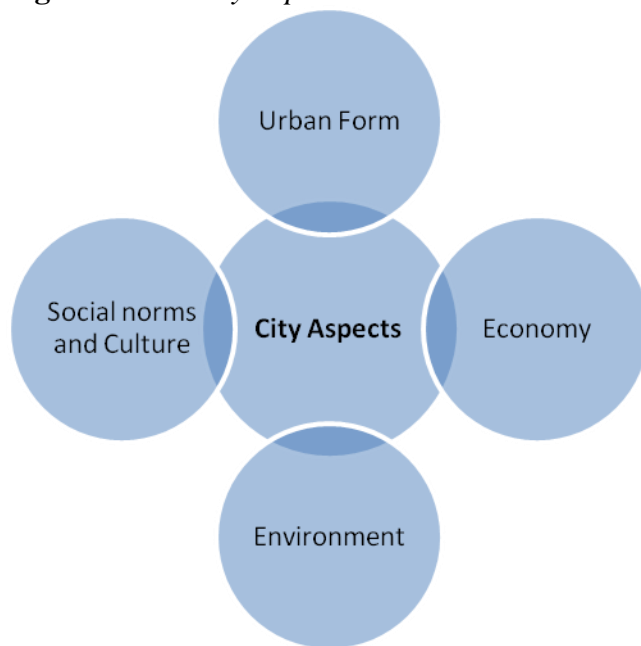
The seven main authorities that play a major role in sustainable development for Riyadh City, especially in mobility, have been targeted for sampling, namely:

1. The Ar Riyadh Development Authority (ADA), 11 interviewees, including the Director of transport and planning, Director of Designing and Urban planning, Consultant of the Ar Riyadh metro project, Director of transport economics, and other engineers in transport and planning departments.
2. The High Commission of Public Transport (HCPT), the Director of the High Commission of Public Transport.
3. The General Administration for Traffic (GAT), two interviewees, including the General Director of the Department of Traffic in Saudi Arabia, and Director of Traffic Safety Department.
4. King Saud University (KSU), three university academics engaged in transport research.
5. Tatweer Educational Transport Services Company (TTC), the Chief Executive Officer.
6. Ministry of Municipal and Rural Affairs (MOMRA), including the General Director of urban planning and consultant of the Ar Riyadh metro project.
7. Riyadh Municipality, including the Director of studies and planning, and four engineers engaged on RPTP studies and design.

All interviewees were contacted in person. Copies of the interview documents were distributed to participants prior to the interviews via email or in hardcopy. Thus, twenty-five face-to-face semi-structured interviews were carried out in summer 2015.

The highest proportion of interviewees was from ADA because it is the responsible authority for design, implementing public transport infrastructure, and operation in the future, in collaboration with other authorities. After providing the interviewee with details for the study main objective, permission was sought to record the conversation. The interviews were organised according to the city aspect as shown in Figure 3. Thus, interviewees were requested to indicate to what extent they believe these aspects would be impacted as a result of introducing public transport and related interventions in Riyadh City.

Figure 3. *The City Aspects*



Data Analysis

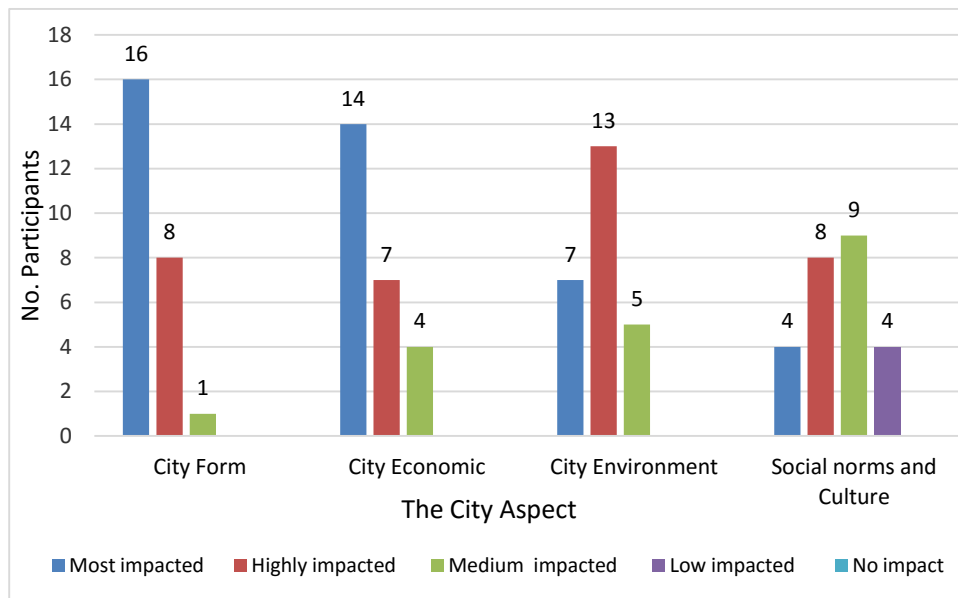
The collected data were transcribed and documented according to the city aspects as shown in Figure 3. NVivo 9 qualitative software was used to analyse the data.

The description of the study results followed the suggestions of Sandelowski (2001) and Cauwenberg et al. (2012) for quantifying qualitative data to be presented numerically in score or scale. Therefore, based on the design of the study questions and for interpretation of the study results, ‘the study respondents agreed, general belief or the majority’ indicates a 75% or more agreement or similar belief among all interviewees. ‘A lot of, or many’ refers to between 75% and 50% of respondents, ‘some’ is between 50% and 25%, and ‘few’ indicates less than 25% of respondents.

Results

Interviewees cited evidence in the Metropolitan Development Strategy for the Riyadh (MEDSTAR) project, and the Riyadh Comprehensive Public Transport Plan by Canadian from the Intelligence Buildings Infrastructure (IBI) group in 2002 and 2006 respectively, which identify a public transport system being necessary for Riyadh City. The majority of the interviewees thought there was a necessity for a public transport system and related interventions to improve mobility and the quality of urban life. Generally, interviewees felt that the majority of city aspects are already formed and that the possible impacts of introducing public transport and related interventions in Riyadh would take at least 10 years to be obvious.

Figure 4. *The Expected Impact of Implementing Public Transport and Related Interventions*



Urban Form

As shown in Figure 4, city form was expected to be subject to the highest impact in contrast to the remaining city aspects. One interviewee mentioned that “Reshaping the city form is part of the reason for introducing public transport in Riyadh City, we cannot continue expanding the city and relying on private cars for use. It has impacts on expansion of infrastructures, cost, city life of citizens, time lost in car traffic, the decreasing quality of air, as well as difficulty for pedestrians”. Interviewees felt that the mode of travel plays a vital role on the city planning in which the current planning is compatible with private cars. It was thought that there would be changes in travel demand and population density and more activities around public transport corridors and stations.

The majority of the interviewees agreed for that along with the introduction of public transport services, appropriate strategies related to city planning have to be implemented as well. They added that allowing for high-rise buildings, transit-oriented development (TOD) sites connected with a high-frequency public transport service, parking monitoring, and improvement of infrastructure for walking, would play a major role in changing the current city form positively. One interviewee from ADA felt a reshaping of the current city form would be necessary “since it is the first project in Riyadh City; it will change urban development around the main public transport stations and around transit-oriented areas, which amount to 13 areas inside Riyadh City”. Another participant hoped that “the successful operation of public transport in Riyadh City would slow down the current city sprawl”. One of the interviewees argued, “due to economic growth, the low cost of travelling long distances by car, and no natural borders for Riyadh City, [has caused the city to] expand many times”. Generally, there was a belief among the majority of interviewees that the proposed RPTP size in providing six lines of metro and bus networks and other transport services in Riyadh City would definitely change urban development, especially around public transport stations, corridors, and TOD areas.

City Economy

Many participants argued that the capital investment of \$ 22 billion in the city for building a new public transport system is considered a significant economic value added to the city’s economy. One interviewee from ADA indicated that the project was expected to reduce unemployment by offering 15,000 jobs for the Saudi society in public transport or in the surrounding areas, such as hotels, offices and shops.

They added that investing in public transport and related interventions undoubtedly will expand services and improve city mobility. The majority of interview participants stated that currently Riyadh roads are over congested and this adversely affects businesses and households’ mobility, so they hoped that public transport would provide direct travel cost savings for those people who switch to use public transport services, leading to a shift in consumer spending. Some of the participants mentioned that public transport hopes to improve accessibility of the whole city which will aid travellers and improve productivity of city business.

Another interviewee stated that public transport would save the household budget, for example, nowadays each family would do more than four morning trips to different destinations. He added that in this case the family opt to pay more for costs associated with cars and hire drivers or arrange taxis. So, there is a general hope among the study participants that public transport would help reduce vehicle ownership costs when family members walk or need just one car to drive all family members to the nearest station and they can reach their destinations by public transport.

City Environment

The majority of interviewees felt that the Riyadh City environment would be positively impacted and that was one of the main objects of the project. For example, one of the participants stated that currently 17 million litres of fuel burn daily in Riyadh City as a result of reliance on private cars, so public transport will definitely help to reduce this amount and that would positively reflect on the city environment. Some of the interviewees felt that successful operation of public transport in Riyadh City would be a great solution for the current city environmental problems.

Saudi Norms and Culture

Generally, it was felt that both social norms and the Saudi culture will be impacted by introducing public transport services related interventions, but it will take time for behaviour to become modified in comparison to other themes. Interviewees felt that there would be more social interaction along with the introduction of public transport services since daily journeys are a part of social life and culture. They added that the shift from private cars to public transport would result in a qualitative move and closeness in society. One of Riyadh Municipality interviewees thought that, "Introducing a public transport system in Riyadh City would be one of the programmes to change social norms in positive way". The majority of interviewees thought that offering a reliable public transport service would make people more aware of time and to respect public places. Another interviewee from Riyadh Municipality stated, "More strict strategies are planned to be implemented along with introducing a public transport system in Riyadh City. For example, there will be safety measures and tools to restrict anti-social acts and protect the staff, passengers and property of public transport. The interviewee felt that these roles aim to encourage public transport use and at the same time would play a vital role in the social life of the communities. He added that there would be a penalty for using the public transport service without paying for a ticket and for any vandalism on all public transport facilities".

Discussion and Conclusion

The current study used semi-structured interviews to investigate the impacts of introducing a public transport system and related interventions in Riyadh City for the city form, economics, environment, social norms and culture. The findings show that public transport would make a positive contribution on all city aspects within different scales of time. City form would be more highly impacted than the economy but in terms of time scale the economic influence of investment in public transport has already appeared since the RPTP work started. A medium impact is expected on the city

environment while impacts on social norms and culture would take a long time to become obvious.

The study findings show that the current Riyadh City form is highly dominated by private transport infrastructure, and there is a disconnection between land use and other travel alternatives such as walking. As the RPTP is the biggest project in the country and the first travel alternative, study participants believe it will reshape the city form. In line with this view, Amin et al. (2013) state that sustainable mobility shapes the urban form. TOD sites, park and ride schemes, metro stations and bus stops, and physical change measures to re-establish connection to public transport services would bring about dramatic changes in the current city form. Sustainable operation of the Riyadh public transport and activating related interventions would decrease the rate of current city expansion and increase their density. Cervero and Murakami (2008) maintain that physically TOD's features refer to three dimensions; density in accommodating enough population living within acceptable walking distances from public transport services; diversity in land uses and housing types; and design that embodies physical features encouraging walking, biking, and public transport ridership as well as social engagement.

Interview results show a widespread support for allowing high-rise buildings along public transport lines and surrounding areas. These are seen as necessary strategies to improve city sprawl, increase density, recentralise city activity, improve access to public transport services, and increase ridership. A recent study from Pojani and Stead (2015) confirms these findings as they found that success of non-motorised travel modes and public transport practically and financially required high density and mixed land use.

In economic terms, introducing public transport would lead to direct and indirect economic benefits broadening economic growth in Riyadh City. In the study results, the impact of spending on the project capital investment and operations cost will support the city economic through creating jobs and stimulating the economy. Moreover, public transport would lead to mixing land use and improving properties value. These results are in line with the study by Aschauer and Campbell (1991) in the last decade and a recent study by Weisbrod et al. (2014) which states that investing in public transport supports the city economic in several ways, such as improving employment status and centralising the economic activities. As it is stated by Al-Mosaind (2001) and confirmed by the majority of participants, households' spending for daily mobility in Riyadh increased dramatically as a result of the spreading of the city, increases in average household size, and the unique social characteristics and culture. Thus, the study results revealed a general hope among the majority of interviewees that the introduction of public transport would reduce households' spend when they modify their travel behaviour by switching to use the nearest public transport station instead of private cars. Moreover, public transport would improve city accessibility, save costs and time for passengers and at the same time it would reduce congestion costs and improve automobile mobility, saving time and costs of peak period automobile travellers.

Nevertheless, the study results maintain that the sustainable operation of Riyadh public transport would improve city mobility on the whole and provide access for jobs and education; reduction of accidents will save lives and damage to roads and associated expenditure; and reduce emissions. All these results are in line with recent studies by Weisbrod et al. (2014) and Litman (2015) which classify the benefits of investing in public transport in urban areas to direct and indirect benefits.

From a viewpoint of environmental impact, the study results show that the traffic demand has exceeded 8 million vehicle trips in Riyadh City, generating thousands of tonnes of solid waste. The city weather is dusty, dry and very hot in the summer. The city air quality shows elevated levels of pollution including CO₂ emissions and Particulate Matter (Alharbi et al. 2015). The study results show that Riyadh public transport is expected to reduce motorised travel by 10% to 15% and this number would increase with time when people become familiar with the service. Thus, sustainable operation of public transport in Riyadh City is hoped to minimise environmental pollution by reducing motorised travel. Riyadh public transport has been designed using solar energy and other environmental friendly power such as electric metro and ultra-low emission technologies for buses. The majority of the study sample argued that a sustainable national plan is needed to improve the city air quality and noise. It is important to raise awareness of environmental considerations in education and the workplace. Developing environment-friendly practices such as integrated and safe pedestrian networks in most important parts of the city will discourage the use of private cars and encourage people to walk.

There are less expectations that social norms and culture, which are regularly stated to be barriers of public transport ridership in Saudi Arabia, will be affected in the short-term as a result of introducing a public transport service in Riyadh City. The social norms and culture in Riyadh City are derived mainly from Islamic religion. This aspect must be taken into account and respected in all services and interventions such as privacy and preventing the mixing of men and women. Moreover, Riyadh society is highly reliance on private cars and has not been accustomed to any other kind of transport modes. The study findings show that changing social norms and culture towards public transport ridership in Riyadh City will need persuasive, soft measures directed at households and individuals. The shift from private car to public transport will result in a qualitative move and closeness in society. Providing a service which is comparable in time and comfort to using private cars is perhaps the major challenge to persuade the general population to shift to public transport in Riyadh City (Aldalbahi and Walker 2015).

Arguably, hard measures such as building infrastructure and pricing policies are not sufficient to change people's perception towards private car and public transport (Zhang et al. 2015). With reference to soft measures, the study means the quality of public transport service such as security, safety, comfort, convenience, and reliability would play major roles in influencing travel mode choice in Riyadh City. Litman (2015) argues that the quality of public transport such as providing a comfortable and convenient service would

attract more public transport users; even if the trip takes somewhat more time compared to driving. Moreover, the study findings show that a sustainable public transport operation with a high quality of service such as reliability, security and safety would reinforce the spirit of commitment of time and deadlines, and provide more respect for public places in Riyadh society, as well as increase women's participation in employment and other activities. Moreover, general public campaigns and school lessons teaching general people and students the benefits of public transport services, how they can pay for tickets and information about prices, and how they would behave on board, would be essential strategies for social norms and culture to be able to use the public transport service. According to Aldalbahi and Walker (2015) changing Saudi attitude and then travel behaviour is a gradual process and will take a long time to be achieved. People will only change their behaviour if they have the opportunity, ability and motivation to do so (Boschetti et al. 2014).

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