



Railway transit services in Algiers: priority improvement actions based on users perceptions



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ABSTRACT

The Algerian Government has recently promoted transportation projects such as the Algiers metro and tramway services that represent a key part of its political and financial effort to improve mobility in the country. However, public transport systems' profitability requires a thorough diagnosis of the services provided based on users' perceptions and expectations. That is, to invest money according to users' requirements. A methodological approach, which combines an Importance-Performance Analysis and a decision tree model, is proposed as means of analyzing rail services performance in Algiers and identifying the aspects that should be prioritized for improvement actions. Three railway transit services were analyzed in Algiers: the tramway, the metro and the commuter rail. More than 450 surveys were collected per mode. After applying the proposed methodology, results show that there are lines of action common to the three services, and specific strategies that may improve customer satisfaction and customer loyalty with the three railway transit services in Algiers. This is the first full experience analysis about service quality in Algiers' railways transit modes. The proposed two-step methodology is, for the first time, applied for analyzing service quality in public transport.

1. Introduction

The mobility context of developing countries is very different from the situation found in other developed ones. In most of these developing countries the private car is the dominant mode of transport and a tough opponent to public transport (PT) modes. The situation is even worse in countries, like Algeria, that are oil producers and where the price of oil is very low. In these cases, measures for improving the PT service quality becomes necessary for attracting users towards the use of these more sustainable transport modes.

The governments of developing countries should focus on elaborating specific analysis on this area, since PT services represent an essential element for the economic and social development of a nation. Moreover, a sustainable growth of the urban agglomerations will be conditioned to the quality of the PT system. In the North of Africa there are various countries (e.g., Algeria, Morocco) that have started to build metros and light rail transit systems. Particularly, Algeria is developing a wide construction program on guided modes of transport (i.e., metro, light rail transit) to promote a sustainable mobility in its main cities (e.g., Algiers, Oran, Constantine, Batna, Setif, Tlemcen, Blida, Bejaia, Djelfa, etc.) (de Oña et al., 2013).

In the case of Algiers, it is estimated that the population of the province, more than 2.8 million inhabitants, generated 6.5 million trips everyday in 2014 that showed the following modal share: 53% of walking, 30.2% of public transit, 13.6% of private vehicle, 2.2% of taxi and 1% of other modes (Baouni, 2015). Walking is the mode most frequently used by Algerians, who also walk long distances mostly between 600 to 1,000 m and 1,000 to 1,400 m (Baouni et al., 2014). However, the preference for traveling by foot could be due to the lack of a homogeneous offer of public transit and intermodality throughout the city of Algiers (Ait Aoudia, 2013). Furthermore, the private vehicle is experiencing a notable increased use that is exemplified by an 4.77% average annual increase in car ownership between 2004 and 2008 (Safar Zitoun and Tabti Talamali, 2009).

After the 90s, private operators have increasingly dominated the offer of urban transit in Algiers due to the deregulation of the sector after an urban transport crisis in the 80s, and the difficulties experienced by the country during the Algerian Civil War (1991–2002) (Ait Aoudia, 2013; Safar Zitoun and Tabti Talamali, 2009; Chabane, 2013). In 2013, there were 4,439 private operators that accounted for 85.2% of the bus seating capacity offered, whereas two public operators provided the remaining capacity (DTW, 2014). The large number of

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small private operators and the common handcrafted nature of its services (i.e., lack of timetables and fixed routes) contributes to the lack of service quality and the problematic situation of the urban transportation network, frequently congested and so called “anarchic” (Ait Aoudia, 2013; Safar Zitoun and Tabti Talamali, 2009).

It is worth highlighting the political and financial efforts of the government to launch sustainable transportation projects in the last years, which have the metro and tramway services of Algiers as key parts of the solution and major structural axes in the city (Ait Aoudia, 2013). The metro service was first operated in November 2011 and was, at that time, the first underground metro service in Maghreb and the second one in North Africa (after the metro service in Cairo, Egypt) (de Oña et al., 2013). Currently, the metro consist of a 1-line underground rail transit of 9.5 km and 10 stations, and it transported approximately 13 million passengers in its first year of operation (de Oña et al., 2013). The tramway service started operations in May 2011 and it currently consists of a 16.2 km line with 28 stations that transported almost 9 million passengers in 2014 (EMA, 2015). The beginning of the metro itinerary is located in downtown Algiers and goes in the South-East direction across the city. At the metro station Les Fusillés, there is intermodality between one of the four cable cars of the city and the tramway service. The latter serves as a prolongation of the mass transit service in East direction that provides 6 more “communes” (neighborhoods) with access to the city center. Both the metro and tramway service are part of larger projects that consider the extension of the metro network up to three lines and 62 km (Baouni, 2009), and 23 km in the case of the tramway network (RATPDEV. SETRAM, 2015).

Last, the rail transit system in Algiers is complemented by the commuter rail system, a heavy rail transit service that communicates residential, university and industrial areas of the metropolitan area and the city center, and that transported more than 28.7 millions of passengers in 2012 (SNTF, 2014). The commuter rail network consists of two parts: i) a common triple-track railway of 10.3 km and 6 stations that goes southeast across Algiers from the city center until the Harrach train station; ii) the commuter rail continues with a 2-leg railway that communicates the southwestern and eastern parts of the urban agglomeration with double-track railways of 68 km and 42 km respectively.

In this context, it is evident that rail PT is gaining a high presence in the day-to-day citizens' life. Guaranteeing attractive PT services that operate with high level of quality ensures the systems' profitability at a prospect of financial development and social integration. It requires a thorough diagnosis of the services provided based on users' perceptions and expectations. That is, the improvement of service quality does not only mean to invest money in advanced technologies, but also to prioritize actions that influence the level of quality perceived by customers (Freitas, 2013).

In this line, this paper presents a methodological approach to assess the quality of three railway transit services in Algiers: the tramway, the metro and the commuter rail. An Importance–Performance Analysis (IPA) combined with a decision tree model identified the aspects that should be prioritized for improvement actions. By means of an ad-hoc Customer Satisfaction Survey (CSS), users' perceptions were collected concerning a list of attributes describing each local service. The importance of these attributes was derived from users' perceptions by calibrating a decision tree model. The Classification and Regression Trees (CART) algorithm was applied due to its well-known reputation and its advantages over other parametric models (de Oña et al., 2012; de Oña and de Oña, 2015b; de Oña et al., 2015a). Parametric models have to comply with some model assumptions and pre-defined underlying relationships between dependent and independent variables, such as normal data, linear relationships between dependent and independent variables, low multi-collinearity, and so on. According to Garver (2003), these assumptions are almost always violated in customer satisfaction research. If these assumptions are violated, the model

could lead to erroneous estimations of the likelihood of service quality. CART is able to overcome the above-mentioned limitations due to it is a non-parametric model with non-predefined underlying relationships between variables. In addition, IPA approach is applied, as it is one of the preferred methodologies of transport company managers due to its simplicity and graphic results (Foote and Stuart, 1998; Christopher et al., 1999; Figler et al., 2011; Transportation Research Board, 2013).

After this introduction, the paper is organized as follows: a Literature review section provides an overview on current studies on quality and customer satisfaction related to the perception of transit, the Methodology section presents the CART and IPA methodologies; the Data section briefly describes the designed survey, data collection and some descriptive statistics about the three samples; the Results and Discussion part summarizes the main results obtained with the analysis; and finally, in the last section it can be found the main conclusions of the study.

2. Literature review

In recent years, transit service quality has emerged as a very popular topic among researchers, not only in developed countries, where it became a trending topic few years ago (dell'Olio et al., 2010; de Oña et al., 2012; 2014; 2015a; Eboli and Mazzulla, 2011; Hassan et al., 2013; Harvey et al., 2014; Hensher et al., 2010; Liekendael et al., 2006; Nathanail, 2008), but also in developing ones, where studies in the quality field are being booted since the beginning of this decade. Some of these investigations were developed in Pakistan (Irfan et al., 2012), Iran (Mahmoudi et al., 2010), India (Geetika, 2010; Prasad and Shekhar, 2010a, 2010b), Turkey (Alpu, 2015; Aydin et al., 2015; Celik et al., 2014), and Ghana (Ojo et al., 2014).

As a result, some differences are found concerning the approach that, at the present time, is used for service quality evaluation in both contexts. At developed countries, more sophisticated models are implemented (de Oña and de Oña, 2015a) such as discrete choice models (dell'Olio et al., 2010; Hensher et al., 2010), structural equation models (de Oña et al., 2013) and data mining algorithms (de Oña et al., 2012; de Oña et al., 2014; de Oña and de Oña, 2015a). Likewise, sample stratification with advance techniques such as cluster analysis (Wen and Lai, 2010; Wen, et al., 2008; de Oña et al., 2015b) is used for reducing the heterogeneity of users' perceptions; or complex models with random parameters are used for accounting for this heterogeneity (Hensher et al., 2010). Furthermore, combining objective data (technical data) and subjective data (customers' opinions) to evaluate the global quality of public transport emerges as a useful and reliable measurement tool of transit service quality (Liekendael et al., 2006; Nathanail, 2008; Eboli and Mazzulla, 2011; Hassan et al., 2013; Barabino and Di Francesco, 2016). In fact, not only data collected from customer satisfaction surveys is used for service quality evaluation, but also data gathered with stated preference surveys (Eboli and Mazzulla, 2008; Gatta and Maruccci, 2007). In this regard, Barabino and Di Francesco (2016) further developed the SERVQUAL model to integrate objective and subjective data of service quality at different temporal levels (e.g. strategic, tactical and operational). Furthermore, they proposed a service quality gap analysis quantified in terms of percentage of passengers in a category relevant to the gap calculation such as percentage of passengers who perceived a service *in conformity* and *targeted* passengers.

Finally, some studies investigate the complete framework concerning passengers' attitudes towards the transit service. That is, evaluating transit service quality, and the existing relationship with other constructs connected with it: passengers' satisfaction, loyalty, involvement, perceived costs and so on (de Oña et al., 2016; Jen et al., 2011; Lai and Chen, 2011). Nevertheless, many transit operators at developed countries use simple methodological approaches (such as SERVQUAL model or some modified versions of it) for evaluating their services provided.

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