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The Integrated Model on Mobile Payment Acceptance (IMMPA): An empirical application to public transport

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ABSTRACT

This study examines the users' acceptance and usage of mobile payments, focusing on the mobile ticketing technologies applied in a public transport context. We investigate the main predictors of the intention to use mobile ticketing and the relation between those predictors, considering the prominent literature on users' technology acceptance background and extending the knowledge through an innovative contribution. The main models of reference in this study are the Technology Acceptance Model (TAM), the Diffusion of Innovation Model (DOI) and the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The new model that we proposed is called the Integrated Model on Mobile Payment Acceptance (IMMPA), and it was designed specifically for mobile payments in the public transport, on the basis of the models previously mentioned. It was developed by mixing the variables of the existing models and adding new ones tailored to the mobile payment/ticketing framework. The theoretical framework was tested using the Structural Equation Models. The results show that the intention to use a technology is affected by the Usefulness, Ease of use and the Security of that technology. Moreover, the Usefulness is simultaneously influenced by the Ease of use, the Compatibility with users' values and needs and their Attitude towards mobile services. Furthermore, the model confirms the direct relation between the intention to use a technology and its actual usage. The new predictor, that is the Attitude towards mobile services, includes those requirements that every mobile ticketing payment must address in this context: complete information, further information about time and delay, speed of use, intuitive interface, and path customisation. Another new construct detected is the Security, in reference to mobile payment. Because it could represent an obstacle to mobile ticketing distribution, it must be considered by market operators. The originality of the paper addresses the realisation of a new model, the IMMPA, which was specifically designed for mobile payment in the public transport.

1. Introduction

According to the EU Framework Programme for Research and Innovation, European research aims to strengthen the competitiveness of transport industries and develop a better European transport system for the benefit of the citizens. The Commission's approach seeks to reconcile competitiveness with sustainability and to invest in both technology and relevant

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socio-economic research. Considering socio-economic, behavioural and forward-looking activities, such as user needs and behaviour, is necessary to tackle transport-related challenges effectively. Thus, a transport information system must be developed on a European basis to provide real-time data for trips throughout Europe, combining up-to-date information from each relevant transport mode source. In addition, the customer should have easy access to online booking, payment and ticketing services. In particular, the two main priorities of Horizon, 2020 are (i) keeping transport competitive, thus allowing the European transport industry to become a global leader, and (ii) making transport research responsive through socio-economic research and forward-looking activities for policy-making (Horizon, 2020). As defined by the Regulation, 1370/2007 of the European Parliament and of the Council, public passenger transport means passenger transport services that are of general economic interest and are provided to the public on a non-discriminatory and continuous basis. Moreover, according to the Government of the United Kingdom, a sustainable community (Sustainable Communities Plan, Office at the Deputy Prime Minister, 2003) must offer good public transport. The development of new methodologies creates conditions for balancing passenger demand and the supply of public transport. Hence, local public transport, defined as a system of transport intended for use by the local community, should be considered a lever for the development of local and national economies.

Currently, public transport services, at both the regional and local levels, include all of the transportation systems on land, sea, lagoon, lake, river and air that operate continuously or river and air services that operate continuously or periodically with prearranged itineraries, schedules, frequencies and tariffs, for general access. As Edvardsson et al. (2005) state, the issues associated with the most common service characteristics of intangibility, heterogeneity, inseparability and perishability have usually been considered from the perspective of the service provider, rather than that of the customer. The growing flows of passengers are characterised as people who need to move easily from the place where they live to where they work or spend leisure time. Thus the accessibility becomes a relevant concept to allow passengers' transfers. The accessibility is defined in several ways but in particular, from the passenger's perspective, accessibility is the extent to which land-use and transport systems enable individuals to reach activities or destinations by one mode or a combination of a transport modes at various times of the day. From the perspective of the locations of activities, accessibility is the extent to which land-use and transport systems enable companies, facilities and other activity places to receive people, goods and information at various times of the day (Van Wee, 2013).

Geurs and Van Wee (2004) argue that accessibility is composed of four components, of which in particular the transportation and the individual components are of interest in this context. The first describes the transport system, expressed as the disutility for an individual to cover the distance between an origin and a destination using a specific transport mode; this includes the amount of time, costs and effort. This disutility results from the confrontation between supply and demand. Whereas the supply of infrastructure refers to location and characteristics such as maximum travel speed, number of lanes, public transport timetables, and travel costs, the demand relates to the passenger. The individual component reflects the needs (from demographic characteristics), abilities (e.g., physical condition, availability of travel modes) and opportunities (e.g., people's income, travel budget, educational level) of individuals.

Obviously, these characteristics influence a person's level of access to transport modes. Moreover, even factors such as income, age, sex, household structure, lifestyle factors and related preferences and attitudes are assumed to have an impact on travel behaviour (Kitamura et al., 1997; Cao et al., 2009). Furthermore, to meet people's needs, the transport system must address the time, space and travel time reliability, which travellers consider to be very important, though it is not currently included in transport models and accessibility analyses (Bates, 2001).

Customers of public transport systems have traditionally been considered passive consumers (Lovelock et al., 1987), but their role is changing from isolated to connected and from aware to informed (Prahalad, 2004) and active participants in the value-creating process (Vargo and Lusch, 2008). In this context, innovation technology represents a key factor that can enhance the citizens' quality of life. On this strength Directive, 2010/40/UE on the general framework for the deployment of Intelligent Transport Systems promotes the loading of tickets through dedicated data transmission and the validation and control of such tickets through mobile communication devices equipped with proximity technologies. Specifically, mobile ticketing can bring benefits such as reduced purchase time, easier ticket validation, queue avoidance and the possibility to obtain customised information about timetables and delays on the move while using public transport. By constructing personalised experiences, customers participate actively in the value creation process (Prahalad, 2004; Bendapudi and Leone, 2003; Edvardsson et al., 2005). The activities that are embedded in value creation from Prahalad's point of view are customer engagement, self-service, customer experience, problem solving and co-designing. Self-service seems to include mobile ticketing because it represents those technologies that enable customers to order, buy and exchange resources with companies without any direct interaction with their employees (Meuter et al., 2000). Moreover, some authors state that by providing more self-service options, it is possible to increase usage.

Thus, at the national level, to boost the use of electronic tools and thereby improve services for citizens in the field of local public transport, local public transport companies need to promote the adoption of interoperable electronic ticketing systems.

Even if the benefits of the implementation and deployment of mobile ticketing are evident, it is first important to understand whether people are willing to use this type of service. Indeed, uncertainty is an important obstacle to the adoption of innovations because an innovation's consequences may create uncertainty: "consequences are the changes that occur in an individual or a social system as a result of the adoption or rejection of an innovation" (Rogers, 2003).