

A Technology Acceptance Model for Mobile Systems to Support and Enable Car Sharing

Masterarbeit

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1 Introduction

1.1 Problem Statement

Information technologies are almost omnipresent in today's everyday-life. Their presence not only shape the working environment but also people's daily life. With the remarkable spread of smartphones, the importance of mobile devices grows and cannot be ignored anymore. Current analyses show that mobile penetration rates already exceed 100% in industrialized countries (see Borges et al. (2011), p. 173) and more than every second mobile phone which is sold in 2011 among young adults under 30 years in Germany is a smartphone (see Bitkom (2012), p. 1). The recognition of these developments is reflected in the fact that mobile systems increasingly find their way into other industries for instance even the automobile industry.

The spread of car sharing offerings mainly in urban settings is another trend influencing the automotive environment and mobility as well as transportation in general. Besides technical progress, further signifying developments influence current and prospective everyday-life. The urbanization, demographic change, economic developments, and the demand for sustainability put major pressure on transportation systems and mobility. The need for multimodal transportation that integrates different transportation modes, increasing sharing trends in general as well as new technological foundations are key trends driving the development of new mobility solutions such as car sharing (see Leveque (2011), p. 3).

An adequate and efficient car sharing program is characterized by ecological and economic benefits, and increases the individual mobility of its users. Through car sharing, people can take advantage of the benefits of private cars without the trouble of car ownership regarding maintenance, parking fees, fuel and other costs (see De Lorimier/El-Geneidy (2010), p. 3). To meet customers' demand of flexible, spontaneous one way trips, a dense network, complex systems and a reliable fleet management are necessary. This way car sharing complements existing transportation modes and even fills the missing link between existing offerings such as train, subway, bus, cycling or walking. Among others, information technologies and particularly mobile systems contribute to the success and growth of customer-friendly car sharing programs. An important issue which needs to be

assessed in this context is what drives the acceptance of mobile systems in car sharing. Certainly, their success crucially depends on the fact that people accept and use mobile systems instead of rejecting them. The analysis of acceptance of mobile systems in car sharing is approached by conducting a study using a Technology Acceptance Model to examine the impact of different influencing factors on the intention to use mobile applications in car sharing. This thesis uses an extended Technology Acceptance Model, developed on the base of a meta-analysis of 20 papers, to analyze crucial factors of influence using specifically collected data, which were conducted during the survey.

Given rising challenges in the environment of mobility and of mobile systems, the questions arise, how mobile systems can support and enable car sharing and what are the crucial factors of technology acceptance of mobile systems in car sharing. Therefore, the following thesis intends to deliver insights with the following three major goals:

- Highlighting the meaning of car sharing in today's individual mobility
- Identifying and analyzing fields of applications of mobile systems in car sharing
- Analyzing technology acceptance of mobile applications in car sharing

The central intention of the empirical analysis is the identification of determining factors of acceptance of mobile applications supporting and enabling car sharing.

1.2 Demarcation of the Subject

There are many different car sharing offerings on the market and the demarcation is not always clear. This study only focuses on professional organized providers, and excludes programs which are organized mainly privately among friends and neighborhoods as well as carpooling programs. Peer-to-peer programs, commercializing shared cars, are not considered as well. Since there is a multitude of existing and newly founded car sharing programs worldwide, this study cannot claim to be complete. Rather an overview of major programs and interesting offerings is given. Furthermore, this study only considers B2C relations meaning private consumers as costumers of car sharing offerings and not organizational customers, since different demands need to be applied for this customer group.

Regarding the technology acceptance research, the Technology Acceptance Model is widely applied in organizational contexts. Since this study focuses on individual

usage, namely on the technology acceptance of car sharing users regarding mobile applications, an organizational context is no issue and therefore left out.

1.3 Structure of the Thesis

In the following, this thesis provides general information on mobility, including major trends and central challenges influencing mobility such as urbanization, technical progress, demographic change, and sustainability. Subsequently, the development of car sharing as an alternative form of mobility is outlined, including definitions, crucial characteristics, the historical development, and a current status. Since modern technologies, especially the internet and mobile systems, also have an important impact on car sharing, changes in the world of business due to these technologies, foundations of Electronic and Mobile Business, success factors of mobile services as well as the development of mobile communication standards are described. The last part of chapter two addresses the technology acceptance research by specifying the term 'acceptance', and advancing the Technology Acceptance Model of Davis and Information System Success of DeLone and McLean to lay the foundation of the empirical analysis in chapter four.

Afterwards, in chapter three the analysis focuses on the importance of the status symbolism associated with car ownership as well as new developments and portrays the status quo of car sharing. The impact of car sharing on mobility with new opportunities for mobile systems is discussed in more detail focusing on challenges and possibilities of new power train technologies and opportunities due to different business models and the role of pricing, followed by an outline of possible future scenarios.

Subsequently, in order to take a closer look at influencing factors of acceptance of mobile applications to support and enable car sharing, the current status of mobile applications in the automotive industry and particularly in car sharing is outlined before evaluating the importance of technologies and discussing the role of possible market players. Combining car sharing and mobile systems, possible fields of applications of mobile systems in car sharing are analyzed. This analysis is done from the viewpoint of customers and additionally taking into account suppliers' decisions. In this context, also the role of different application possibilities is discussed. Concluding, the illustration and description of the overall conceptual framework gives a review of influencing factors and crucial variables of technology

acceptance regarding mobile systems in car sharing which are developed based on a meta-analysis of 20 papers. Consequently, selected variables are analyzed in more detail and for each factor a hypothesis is advanced regarding the acceptance of mobile applications in car sharing.

The quantitative analysis of technology acceptance in chapter four starts by stating the scope of the examination and describing the data collection, before the sample design and the design of the measurement model is illustrated in more detail. The empirical analysis is structured in the assessment of reliability, validity, criteria for measurement quality of the structural equation model as well as the analysis of the advanced hypothesis. Concluding, the discussion of results, managerial implications and recommendations for future research are proposed before summarizing the key takeaways of the study.

2 Theoretical Foundations

2.1 Mobility as a Major Component for Future Trends in Mobile Systems and in Automotive Industry

Expressions and possibilities of mobility are influenced by a variety of trends such as developments in information and communication technologies (ICTs), increasing globalization, and an increase in regional integration (see Pohl (2001), p. 15). New technologies do not only add to the physical mobility of economies and societies, but also to the social and communicative components. While increasing spatial mobility is illustrated by the growing variety of mobility offerings, social and communicative mobility is visible in a growing number of mobile phones, smartphones, laptops and so forth. This trend is crucial for future developments of mobile systems in other industries such as the automobile industry.

Further central challenges stem from several influencing factors of technological, economical, social, ecological, and political or legal nature. Urbanization is without a doubt one of the central challenges that will crucially influence mobility in future (see Hanselka/Jöckel (2010), p. 21). Due to growing population numbers in urban regions, mobility will face new problems. Megacities are not able to handle the enormously increasing amount of individual transport without alternatives and other forms of mobility such as public transportation systems, carpooling systems or car sharing offers. Otherwise a lack of space of parking, enormous traffic jams or even a lack of

tests to assess the actual usage situations and processes are possible means to find out crucial characteristics which an application should possess. Considering the new challenges of new power train technologies as well as the different challenges of business models, it is situational what set of functionalities an application should have. Based on these basic business conditions, a suitable application is to develop.

5 Conclusion and Future Research

The resulting model demonstrates good explanatory power based on the findings of several reliability, validity and quality of measurement criterions. However, regarding further research a greater sample size could have provided further insights especially regarding the factors that could not be applied, namely perceived ease of use, perceived trust, and reliability. In addition, pretests and a refinement of scales and items could also lead to improvements of the measurement instruments. If further analysis are based on an extended sample size, it seems useful to distinguish between customers of different business models, since business model-specific differences could be distinct. Although many car sharing offerings are already multinational (e. g. car2go in Germany and the United States, Zipcar in the United States, Canada and the United Kingdom), the role of country-specific differences is to analyze. Country-specific analyses become even more interesting if countries differ in wealth, size, economic position, or situation of transportation and traffic system are involved.

To capture the full range of influences, it could also be useful to consider social aspects like social influences and norms since social groups could be determining among others for car sharing usage and smartphone ownership. Besides focusing on the service quality and individual factors, hedonic aspects such as enjoyment or fun could be determining for some customers as well when using mobile applications.

The key takeaways of the study are summarized in the following. Car sharing offers great potential as a missing link in transportation systems especially in urban mobility. The central benefits of car sharing are cost savings for customers in comparison to vehicle ownership and by reduced congestion and reduced parking costs, environmental advantages due to reduced emission, more efficient transportation systems when linked with other transportation modes, and increased individual mobility. The higher governmental support of car sharing systems is and the better multimodal linkages are created, the faster is the adoption process among

customers. Prospectively, the offer of one way trips, spontaneous rentals with open endings as well as fleets consisting of environmental friendly vehicles are determinant for the acceptance of customers and therefore for the success of car sharing programs. Furthermore, the application of new technologies such as RFID technologies and mobile apps contribute to a frictionless and simpler car sharing usage process fostering the acceptance of customers and therefore the success of car sharing offerings. Additional success factors of car sharing programs are a dense network, the offer of different car models and a comprehensible pricing system.

Since different industries can contribute to these goals, co-operations grow in importance. Co-operations with car rentals to include their knowledge about standard rental processes and especially in the one way rent segment can be beneficial to car sharing offerings. To guarantee better linkages to other transportation modes, co-operations with other infrastructure suppliers can be a success factor. With regard to the growing number of EVs in car sharing, the importance to cooperate with energy suppliers and network operators increases. Since vehicles of car sharing are increasingly equipped with a variety of systems, more and more technologies find their ways into car sharing, especially mobile systems. These modern technologies are one driver of recent growth rates in car sharing, since they enable more efficient and customer-friendly car sharing usage processes. The integration of mobile systems is one of the key success factors for the adoption of car sharing. These tendencies also introduce new partners such as technology providers and telecom providers to the circle of car sharing co-operations. The progress in efficient vehicles and fleet systems in car sharing is also due to the commitment of vehicle manufacturers in the field of car sharing in the past years. Their involvement in car sharing indicates their recognition of new trends in mobility and of changing customer demand and behavior of some customer groups. It is also a way for vehicle manufacturers to learn about consumer behavior, urban mobility, and to promote EVs. In order to be a market leader when car sharing takes off in the future, car sharing suppliers need to enter the market today which explains their current commitment although the market still is relatively small.

Mobile systems crucially contribute to the growth rates in car sharing meaning that they are one important factor to support and enable car sharing. They are especially important for flexible business models including one way offerings. The numerous fields of application of mobile systems in car sharing include availability checks,

localization of cars, delivery of telematics information, reservation processes, navigation services, identification, personalization settings, LBS, information services, pricing incentives, account management, and mobile payment. Regarding the acceptance of mobile applications in the context of car sharing, developers should particularly pay attention to the target group and their demands since their perceived usefulness of the application and their general former experiences are determinant for their acceptance and usage intention of mobile applications. The more experienced users already are, and the more useful they rate this particular application, the higher is their intention to use the application in the car sharing context.