

Mobile Payment für Mobilitätsdienstleistungen: Analyse und Konzept

Masterarbeit

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1 Introduction

Carl Benz' invention of the car in 1886 and Henry Ford's invention of manufacturing cars in assembly lines both were major steps in the development of a vehicle that combines flexibility, mobility and individuality. This kind of mass-available cars provides new mobility and became a status symbol of society in the past and nowadays. Due to different practical and non-material reasons, it has become an integral part of our society (Wittig J., 2005, p. 3). Besides other benefits, it creates the opportunity to move around independently (Buhr R. et al., 1999, pp. 12-14).

Facing the problems caused by the amount of registered vehicles and the resulting need of space for "calm traffic", especially in cities, it is being discussed how to cope with the problem of moving around freely, while at the same time abolishing the need of cars and creating a sustainable form of transport (Glotz-Richter M. et al., 2007, p. 333; Buhr R., 2004, p. 103). Mobility services may be beneficial for coping with the general needs of people to move around. The aim of these services is to improve the efficiency, environmental friendliness and social acceptability of mobility in society by influencing their choice of vehicle (Loose W./Doberschütz B., 2003, p. 1).

In general, mobility services can be categorized into three individual types. First, there are intermodal navigation and traffic information systems, which can be used independently of the vehicle and support changing a transport carrier, e.g. from taxi to rail. The second type are mobility agencies that offer integrated mobility information about available transport providers in advance or while traveling and in addition provide bookings, reservations and settlement procedures. Finally, people can use mobile-packages, which combine services of public transportation companies with those of other regional transportation providers (i.e. Car Sharing providers) (Loose W./Doberschütz B., 2003, p. 1/2).

One example for this third kind of mobility services is the concept of Car Sharing. It has often been regarded as an interim solution but has gained ground in recent years, so that it now contributes actively towards a more sustainable pattern of urban development (Huwer U., 2004, p. 77).

This service has grown by 15 per cent per year with a continued rise (o. A. a, 2011). According to the Bundesverband Car Sharing (bcs), at the beginning of 2011 there were approximately 190 000 registered users in Germany, which shows a growth of 20 per cent compared to the previous year (o. A. b, 2011). This indicates the increasing popularity of Car Sharing within society and that it is a key factor of a modern enterprise's mobility concept (o. A., 2010). The term 'Car Sharing', also known as car clubs in the UK, describes the organised

and collaborative use of cars (bcs, o. J.;Huwer U., 2004, p. 77). „The concept of Car Sharing is based on the distinction between automobile access and ownership. Car Sharing divorces the notion of automobile use from ownership by providing individuals with convenient access to a shared fleet of vehicles, rather than a single privately owned one.“ (Katzev R., 2003, p. 68). Furthermore Car Sharing provides access to automobiles in form of a subscription service, allowing customers to reserve vehicles by the hour, over the phone or the Internet“ (Goldman T./Gorham R., 2006, p. 267).

The modern Car Sharing system is characterised by a decentralised allocation of cars within an area or city, the choice of different vehicles, a close cooperation with public transportation services and councils, an independent reservation of vehicles, applying Car-Sharing-techniques as well as taking away the work which comes with driving a car (Loose W., 2010, p. 13).

In addition, the concept of Car Sharing has several advantages. The benefits of Car Sharing can include more careful consideration of the necessity, duration and distance of automobile trips, resulting in decreased vehicle use and ownership, as well as greater consideration given to alternative modes, resulting in increased transit ridership, biking and walking. Moreover, Car Sharing can provide cost savings for individuals and employers as well as energy savings and air quality benefits. Finally it can reduce parking demand at participating transit stations, member employer sites and residential locations (innovativemobility.org b).

„In cities with high population densities, Car Sharing exhibits great promise in improving mobility, lowering emission level and reducing congestion problems“ (Britton E. and Associates, 1999 p. 16ff).

Car Sharing not only decreases the pressure of finding parking lots for other road users since one Car Sharing vehicle can replace up to eight private cars. Furthermore, it diminishes car ownership in general (Loose W., 2010, pp. 22-25;Huwer U., 2004, p. 77). Apart from these ecological advantages Car Sharing has an impact on people's social life. A study showed that Car Sharing is used by people who only need to use a vehicle occasionally (Katzev R., 2003, p. 2). „Car-Sharing vehicles are selected based on need. As numerous Car Sharing journeys are taken without large amounts of luggage and without many passengers, compact cars are the predominant vehicles in Car Sharing fleets“ (Loose W., 2010, p. 3). “The fuel requirements and the CO₂ emissions of the vehicles are correspondingly small. In comparison to personal cars nationally, Car Sharing fleets register up to 15 to 20 percent lower specific CO₂ emissions, in some cases even up to 25 percent lower“ (Loose W., 2010, p. 3). An even more far-reaching environmental benefit results from the fact that Car Sharing participation

influences transport behavior in a positive way, or stabilizes existing environmentally friendly attitudes toward mobility. A comparison of households before and during Car Sharing participation shows that the proportion of car-free households grows with Car Sharing participation and the proportion of personal cars kept in the household drops“ (Loose W., 2010, p. 3). With Car Sharing participation, personal cars become, to a large extent, unnecessary. In addition planned vehicle purchases are not carried out and there is no associated loss of mobility (Loose W., 2010, p. 3). Moreover, it allows financial savings (Katzev R., 2003, p. 2).

„Transport modes other than the car can serve most mobility needs. Public transport can be used for short (e.g. bus) and longer (e.g. train) trips, but do not offer enough flexibility for all purposes“ (Huwer U., 2004, p. 77). “Taxi and bicycle offer greater flexibility, but they are limited by distance due to costs, effort and time“ (Huwer U., 2004, p. 77). Car rental serves another need, cause this service is mostly used for trips over a few days when flexibility is required (e.g. business trips). Hence there is a gap in demand between these usual modes of transport, given that for journeys with special purposes, for example visiting a special place, transporting something or travelling at an unusual time, these modes may not be suitable. In addition sometimes people would simply prefer to travel by car. Car Sharing is a possibility to close this gap because it accommodates the rational needs of mobility by car while contributing to sustainable urban development and allows cars to be used efficient. Car Sharing avoid the mobility trap that means once costs are “sunk” into purchasing a car, the marginal costs are lower than many alternatives. Furthermore Car Sharing allows people to choose the appropriate mode for each journey and enables people to compare the marginal costs for all modes for each journey. “As a result, use of alternative modes is strengthened, car trips are reduced and short distances of daily mobility are preserved“ (Huwer U., 2004, p. 77). „In addition, Car-Sharing users use public transport to a considerably higher extent than before. They also make use of bicycles, taxis or rental cars much more than they did previously“ (Loose W., 2010, p. 3).

„To ensure that these positive effects of Car Sharing remain sustainable, the number of Car Sharing customers must grow“ (Nobis C., 2006, p. 89ff.). „It hence becomes vital for there to be supportive regulatory legislation, financial support and easily adoptable operational tools for the continuous growth of the Car Sharing industry“ (G.H. Kek A. et al, 2009, p. 150).

In this paper, not only the existing concepts of mobility services will be presented, for example the concept of Car Sharing mentioned above or the long distance train services, but

they will be further combined and if applicable, developed to create new forms of mobility (Hoffmann C., 2009, p. 31). These new forms of mobility services especially attract two target groups. On the one hand these are households characterized by neither owning a car nor having access to a car such as company cars, vehicles of friends or family etc. On the other hand, car owners are attracted but whose choice of transportation is not restricted to their car. These people will be lead to use multi-modal transport. This is due to the influence of mobility services. Multi-modality in this context means using the best forms of transport for the particular journey. Due to different influences such as the availability of certain vehicles or the amount of baggage and passengers, people may be forced to take an alternate mode of transport (Loose W./Doberschütz B., 2003, p. 1).

1.1 Objective of the Master Thesis

Aim of the master thesis is to provide an overview over current mobility services and Mobile Payment solutions. Thereby the focus is on the mobility concept Car Sharing. Further mobility services will be regarded in this work only marginally. Within the framework of Mobile Payment only the different classifications of Mobile Payment are illustrated. Moreover the basic technologies, which enable Mobile Payment, will be shortly described. However, neither a detailed description or analysis of the technologies nor the consideration of diffusion fostered factors of Mobile Payment, like for example legal regulations that have certainly a strong influence on the distribution of Mobile Payment, are object of this master thesis. Furthermore, only Mobile Payment solutions that are available to the mass market and not limited to users of a certain brand of a mobile phone or an operating system are introduced in this work. With the help of selected experts drivers of Car Sharing acceptance are researched. The online survey also pursued to find drivers of Mobile Payment acceptance. Consequently another question arises, whether the user acceptance of Mobile Payment, as a form of technological innovative system, can explain or support the user acceptance of Car Sharing.

1.2 Motivation

There are two reasons why the topic of this paper was chosen. Firstly, mobile payment has been a research topic of interest to the author in the past. And it is also a current issue of the 21st century, which both concerns and influences today's generation. Thus it is regarded to hold valuable research results that are worth investigating and discussing. The following statements support this: „M-Payments are a small but growing subset of the broader world of

electronic payments" (Porteous D., 2006, p. 17). "They are expected to become one of the most important applications in M-Commerce" (Varshney U./Vetter R., 2002).

A big challenge, especially in the context of sustainability and environmental friendliness, is the growing need for mobility. Since everyone is confronted with different modes of transportation it should be worth exploring the different combinations of transport and ways to improve traveling. One idea that comes to mind is that of Car Sharing, which up to date only plays a minor role in Germany, but is showing great potential.

Facing these two developments, the author regarded it as being an interesting combination of topics. These are the reasons as to why this paper is concerned with mobility services, Mobile Payment and making a connection between these topics.

1.3 Structure of the Master Thesis

This master thesis is divided into eight chapters. The **fist chapter** initially introduces the subject of the master thesis. This insertion is followed by a description of the author's motivation for choosing that topic and a depiction of the papers structure. The definitions that are most important for the comprehension are explained in **chapter two**. The elucidation of the terms mobility service and Shared-Used Vehicle is followed by an overview and differentiation of the terms E-Business/E-Commerce, M-Business/M-Commerce and M-Payment/M-Banking. The **third chapter** describes the mobility concept Car Sharing in detail. This specification consists of a short definition and the distinguishing of Car Sharing obverse the car rental service, an international consideration of the Car Sharing concept as well as a characterization of the status quo of Car Sharing in Germany. Finally the options of cooperation between Car Sharing organizations and other mobility service providers are depicted. Furthermore another mobility service is mentioned: the Bike-Sharing. **Chapter four** deals with the information and communication technologies (ICT) used for mobility services. The **fifth chapter** elaborates the Mobile Payment concept. Inter alia the elementary technologies and the most important players are presented. Eventually the different classifications of Mobile Payment, the status quo of Mobile Payment in Germany as well as the Mobile Payment systems in certain countries are described. The **sixth chapter** connects chapter three and five, that means a consolidation of the subjects Car Sharing and Mobile Payment. **Chapter seven** is about the empiric examinations: A qualitative analysis through expert interviews on the one hand and an online enquiry for quantitative research on the other hand. The master thesis ends with **chapter eight**, which contains a summary of the most

important results, a conclusion and future perspectives. Additionally the structure of the master thesis is illustrated in the following figure:

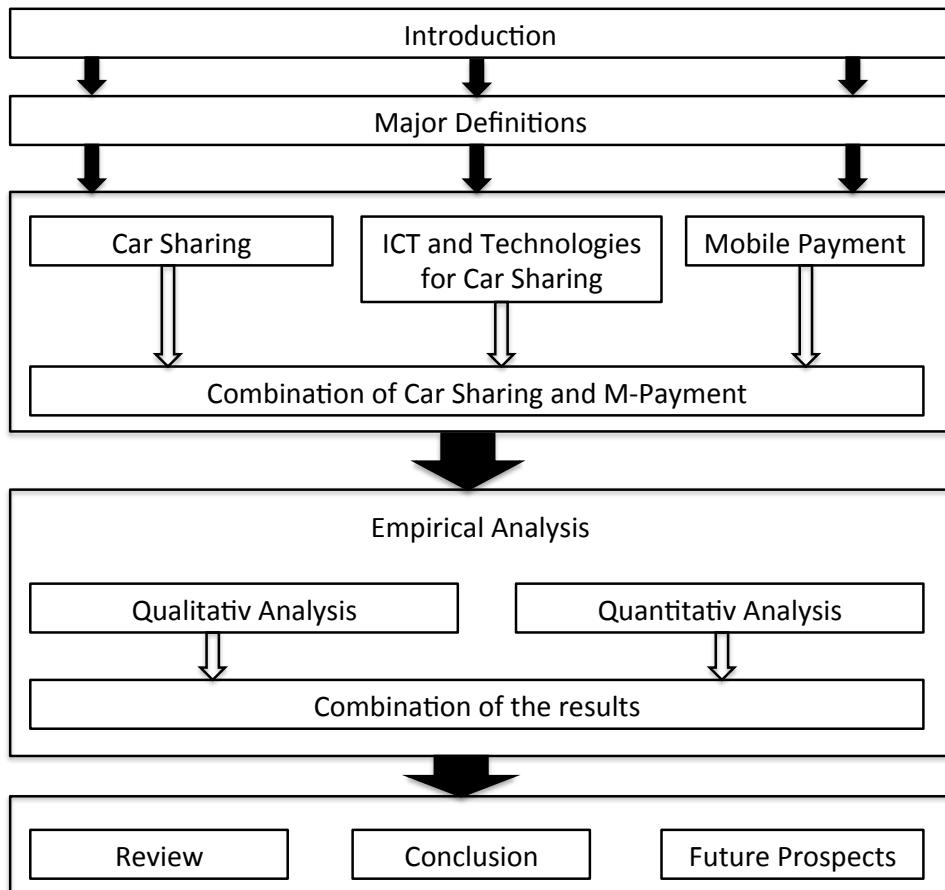


Figure 1: Structure of the Master Thesis

Source: Own representation

2 Major Definitions

Before jumping to the original topics of Car Sharing and Mobile Payment, this chapter aims at developing a basic understanding of the underlying terms that are mentioned across this work. Therefore important definitions of terms relevant to the context of the thesis will be given. An essential clarification of the term mobility services and a classification of Car Sharing within the context of Shared-Used Vehicle Systems are also offered. Afterwards the terms E-Business, E-Commerce and also M-Business and M-Commerce are going to be defined, followed by a differentiation of M-Banking and M-Payment.

2.1 Mobility Services

Mobility services are an option to confront today's challenges of traffic systems, e.g. lowering CO₂-emission. Car Sharing and other ecofriendly mobility services, by many are regarded as having great potential (Harms S., 2003, p. 41 ff.).

8. Closing Remarks

The concluding chapter gives a brief overview of the relevant topics of the study and includes the conclusions based on the empirical research. The final paragraph then closes this paper by looking into the future of Car Sharing and M-Payment.

8.1 Recap

Combining the two concepts of Car Sharing and M-Payment was the original idea and so this research paper started with a detailed examination of the Car Sharing concept.

Car Sharing is the shared use of vehicles that compared to rental car companies varies in some specific points. However the majority of people do not realize these distinctions, which can lead to misconceptions. It could be shown that the concept of Car Sharing shows increasing growth figures throughout Europe, that nevertheless are on a low level. This is the case although concepts differ from each other and are even state funded in some countries and regardless of the fact that many Car Sharing providers offer attractive services. Cooperation between Car Sharing providers and other companies is usual in this area. Thereby the mobility service Car Sharing is just one of many mobility services available at the market.

M-Payment is an Information and Communication Technology that might gain in importance within the next few years.

Up to date the dissemination of M-Payment applications in industrial countries is still relatively low. Nevertheless this could change as NFC-technologies develop further and prospective clients become aware of the promising M-Payment concepts already available at the market. Experts of the Car Sharing industry however do not see few possibilities or the need to integrate M-Payment systems into Car Sharing concepts.

Hence the research question aims at identifying those factors relevant to the user acceptance of Car Sharing and also M-Payment. In order to get a first impression of relevant topics, experts from the Car Sharing industry were consulted and in case of the M-Payment the existing extended technology acceptance model (TAM) in combination with the Compass Model were kept in mind. This led to the construction of a questionnaire containing item blocks that were later analyzed using quantitative analysis.

Based on a quantitative study, five factors could be ascertained that were assumed to influence the sixth factor User Acceptance of Mobile Payment. These factors are: Perceived Use (PU), Perceived Ease of Use (PEOU), General Conditions of Utility (GCoU), Costs, Perceived Risks (PR). A correlation analysis found significant correlations, between User Acceptance of M-Payment and each of the above factors PU, PEOU, GCoU, Costs and PR.

Besides that correlations between PU and GCoU, Costs, PR; GCoU and PEOU, Costs and PR were found. In spite of an assumed multicollinearity, which would render the results of the regression analysis ineffective, the regression found only PU to have a significant positive influence on User Acceptance of M-Payment.

Five different factors, Advantages of CS, Perceived Need, Willingness to Change, Quality and Performance Characteristics and Perceived Risk, were found to influence the user acceptance of Car Sharing. In the latter case effects on user acceptance were analyzed by using the factors Intended and Effective Use. While Perceived Need and Willingness to Change are drivers of Effective Use, Perceived Risk was shown to have a negative effect on Intended Use.

The research question was pursued further in order to identify the influence of the user acceptance of M-Payment on the user experience (intended or effective use) of Car Sharing. It was revealed that user acceptance of M-Payment does not influence user acceptance of Car Sharing. An investigation of further possible determinants (see 7.x) also found no relationships.

8.2 Conclusion

Since the research question number 2: The user acceptance of M-Payment has a positive influence on the user acceptance of Car Sharing, was negated. It can be concluded that the acceptance of M-Payment and the acceptance of Car Sharing are not related. Thus an integration of M-Payment within the Car Sharing mobility concept does not yet seem to be of importance, as it would not boost the success of mobility services.

However the study was successful in revealing drivers and inhibitors of the user acceptance of Car Sharing. Variables that can boost Effective Use are Perceived Need and Willingness to Change. Since these are however not directly approachable by the Car Sharing organization, Car Sharing providers can be advised to invest into decreasing the Perceived Risk, since this is the main hinder of Intended Use, as a concept of attitude acceptance. An increase in Intended Use will over time also lead to an increase in Effective Use.

In case of Mobile Payment, the study was only able to find positive relations of User Acceptance and Perceived Use, Perceived Ease of Use, General Conditions of Utility, while Costs and Perceived Risks describe a negative relationship with user acceptance. Although a regression analysis was not effective, it can be concluded that investments in PU, PEOU and GCoU will benefit a positive user acceptance of M-Payment.

It needs to be criticized that the sample size of this study, with only 66 respondents of the

questionnaire is on the one hand very small and on the other hand very homogenous in terms of age pattern and professional status, leading to a result that might not be statistically representative. In course of the analysis it was also noticed that many questions of the used questionnaire were not usable.

It can thus be recommended to conduct another analysis with a much greater sample, and revised items/questions. The study at hand however could be a point of reference for a more precisely specified qualitative study.

8.3 Outlook

Due to the technical, operational and business complexity involved, Contactless mobile payment is perhaps the most debated and most talked about innovation in the range of Mobile Payment. “In some ways these payments are seen as the most promising as they represent an extension of the way we pay today. Instead of having a physical piece of plastic, sensitive information is digitally stored on the mobile device or on a server” (Edgar, Dunn&Company, 2011, p. 19).

Consequently the value of global M-Payment is expected to grow from an estimated 41,5 billion Euro in 2009 to 140 billion Euro by 2012 (World Payments Report 2010, p. 17). Thereby NFC is the key technology that is generally accepted to be most suitable for contactless payment, because products with built-in NFC will dramatically simplify the way consumer devices interact with one another, helping people speed up connections, receive and share information and make fast and secure payments (Edgar, Dunn&Company, 2011, p. 19). The largest non-cash payment markets within Europe are Germany, France and the United Kingdom. But the maturity of non-cash usage varies considerably by country. Finland and Sweden are the leaders when it comes to usage per inhabitant. In contrast Germans still like to use cash frequently, while cards are used less frequently than in other countries (World Payments Report 2010, p. 10).

The mobility concept – Car Sharing will likely take on a greater positive development.

The BCS predicts a growing number of cities and areas in which Car Sharing is provided and also a concentration of Car Sharing stations and an increase of car Sharing customers (bcs, o. J.).

If the usage of M-Payment across society is increasing and Car Sharing will indeed be perceived as an alternative to an owned car, it is conceivable that M-Payment solutions will be applicable to Car Sharing in the future.

This development could at first take foothold in northern countries, because usage of non-

cash payments is driven by the concerted effort of governments and banks and the willingness of residents to adopt new electronic payment technologies (World Payment Report 2010, p. 10).

In the future it will consequently be interesting to follow the development of both markets – M-Payment and Car Sharing.