# IWI Discussion Paper Series
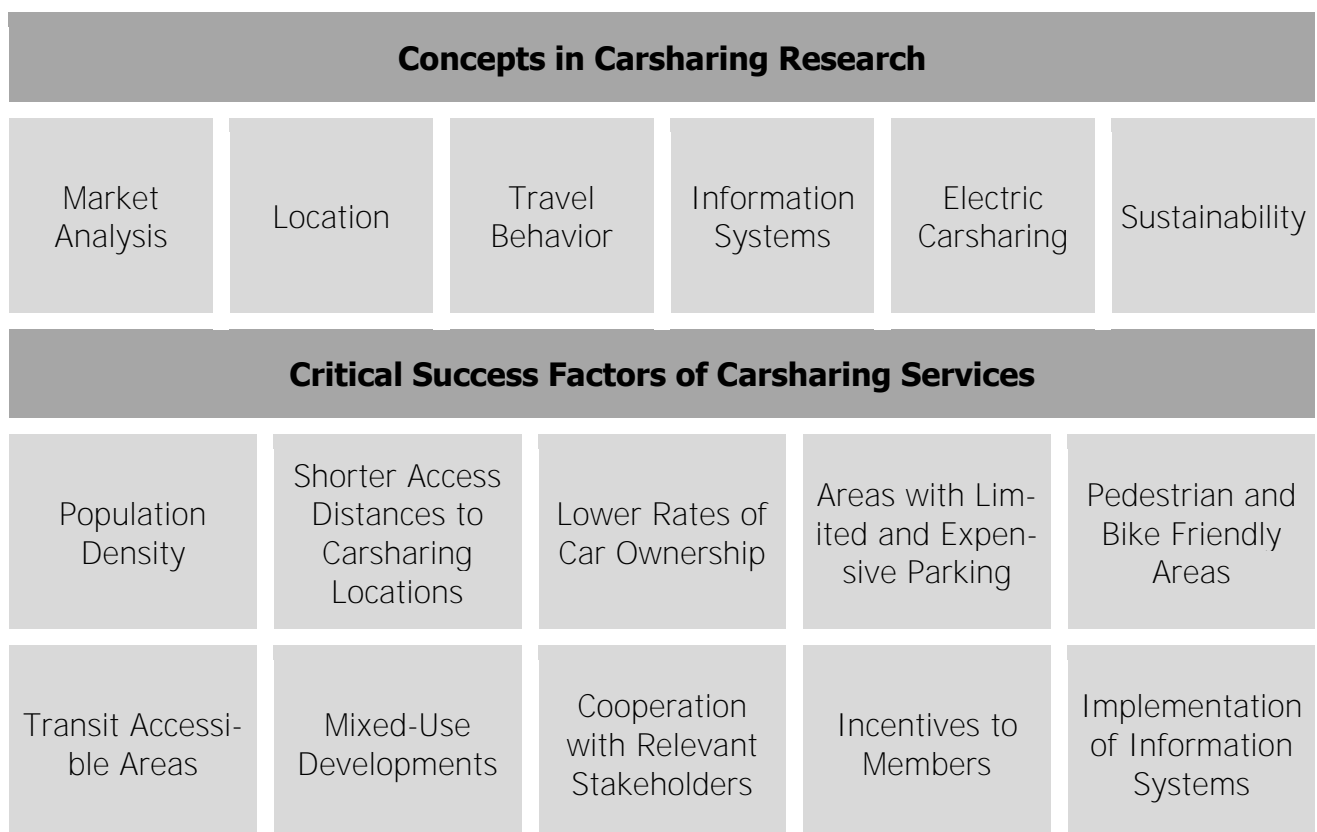# # 69 (September 29, 2015)[1]

# A Systematic Literature Review of Carsharing Research: Concepts and Critical Success Factors

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| Concepts in Carsharing Research | | | | | |
| --- | --- | --- | --- | --- | --- |
| Market Analysis | Location | Travel Behavior | Information Systems | Electric Carsharing | Sustainability |

| Critical Success Factors of Carsharing Services | | | | |
| --- | --- | --- | --- | --- |
| Population Density | Shorter Access Distances to Carsharing Locations | Lower Rates of Car Ownership | Areas with Limited and Expensive Parking | Pedestrian and Bike Friendly Areas |
| Transit Accessible Areas | Mixed-Use Developments | Cooperation with Relevant Stakeholders | Incentives to Members | Implementation of Information Systems |

ABSTRACT *This paper aims to examine critical success factors of carsharing services by conducting a literature review. In order to give an overview of existing carsharing research articles, a conceptual structuring of the topic of carsharing is created. Hereby, 130 articles are analyzed, identifying 6 key concepts, i.e., market analysis, location, travel behavior, information systems, electric carsharing, and sustainability. With regard to the defined parameters of the literature review, the concept of market analysis reveals the strongest interest in carsharing research counting approximately half of the reviewed literature. However, the other concepts have received considerable attention in the past few years, which is why the interdisciplinarity level of carsharing research has grown substantially. Since carsharing is a growing trend in practice as well as in research, we analyze the background characteristics associated with the growth and success of carsharing services by deriving critical success factors from the literature. The critical success factors are discussed for practical implications and recommendations for further research are given.*

# 1. Introduction

An increasing number of research studies investigate the current topic of carsharing, which is regarded as a transportation alternative to private car ownership. Carsharing provides individuals with cars from a fleet on an as-needed basis (Fan, 2013; Shaheen, Cohen, & Roberts, 2006) and is considered as a short-term car rental service (Le Vine, Lee-Gosselin, Sivakumar, & Polak, 2014b; Morency, Trépanier, & Martin, 2008; Tal, 2009), allowing members to gain the benefits of private car use without the costs and responsibilities of ownership (Costain, Ardron, & Habib, 2012; Shaheen, Cohen, & Chung, 2009). Referring to Prettenthaler and Steininger (1999), carsharing is cost saving compared to ownership, if an individual drives less than approximately 15,000–18,000 kilometres per year. Concerning the ongoing urbanization, carsharing can additionally help to reduce environmental pollution and to overcome parking pressure issues (Habib, Morency, Islam, & Grasset, 2012; Shaheen & Cohen, 2012, 2013). However, compared to ownership, carsharing has the disadvantage of less convenient vehicle access (Shaheen, Sperling, & Wagner, 1999), marking a major challenge for carsharing services.

From an economic perspective, the worldwide number of carsharing members and vehicles have grown considerably over the last several years (Figure 1). According to Navigant Research (2013), worldwide revenue from carsharing services will continue to grow from approximately $1 billion in 2013 to $6.2 billion by 2020.
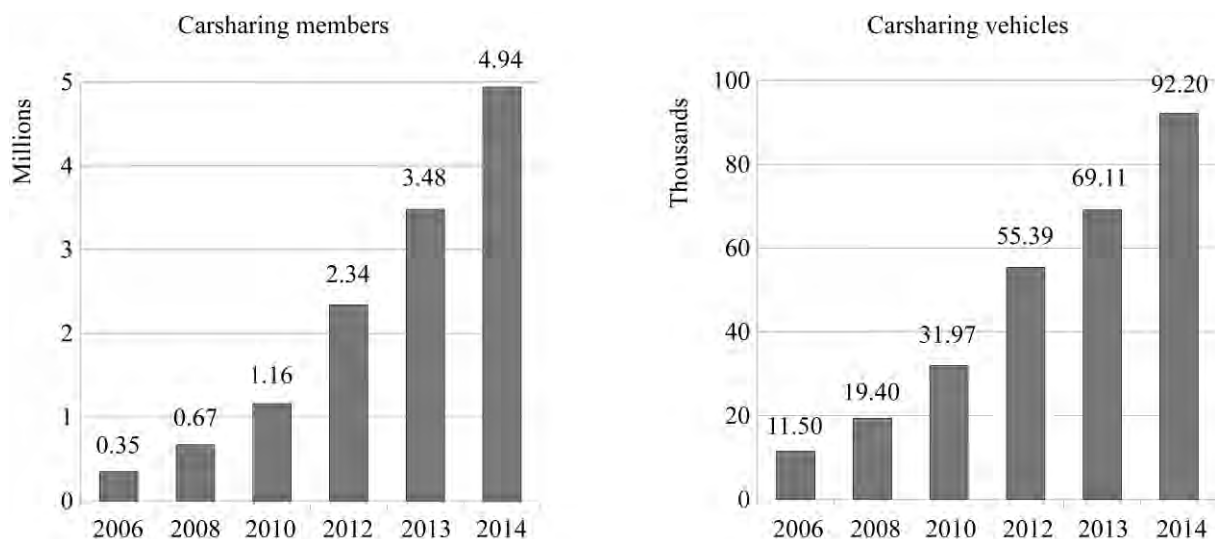


**Figure 1.** Worldwide growth of carsharing services.
*Source:* Frost & Sullivan (as cited in Le Vine, Zolfaghari, & Polak, 2014c, p. 3)

Despite these growth predictions, carsharing is often still referred to serve niche markets (Coll, Vandersmissen, & Thériault, 2014; Green, Skerlos, & Winebrake, 2014; Shaheen & Cohen, 2013; Barrios & Godier, 2014). With regard to Zhou (2014), "the success of a carsharing program relies heavily on identifying and penetrating into niche markets" (p. 318). In this context, critical success factors of carsharing services have been discussed by several researchers (e.g., Andrew & Douma, 2006; Catherine, Faghri, Trick, Fortunaot III, & Suarez, 2008; Ciari, Balmer, & Axhausen, 2009; Correia & Antunes 2012). However, a review of the literature suggests that a holistic structuring of the topic of carsharing with a depiction of critical success factors has not yet been addressed.

In practice as well as in research, the topic of carsharing is becoming more and more important. This paper makes a theoretical contribution by creating a conceptual structuring of the topic and uncovering key concepts, i.e., market analysis, location, travel behavior, information systems, electric carsharing, and sustainability. We give an overview of the current research in the carsharing area by

conducting a literature review. From the identified literature, critical success factors are derived and practical implications for carsharing services are discussed. We explore the following two research questions:

- Which concepts can be identified from the carsharing research literature?
- Which critical success factors should carsharing services take into consideration?

This paper is structured as follows: First, the underlying methodology is described and the development of carsharing research is outlined. After presenting the identified concepts in the field of carsharing research, we examine critical success factors of carsharing services derived from the literature review and give implications for practice. Finally, limitations and directions for further research are presented in a conclusion.

## 2. Research Methodology and Conceptual Basis

To give a holistic overview of the current research in the carsharing area, a literature review was conducted. Following Webster and Watson (2002), an effective review "creates a firm foundation for advancing knowledge" and "facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed" (p. xiii). The underlying methodology is based on the structured approach by Webster and Watson.

First, the following research databases were searched for relevant literature: ACM Digital Library, AISeL, Emerald, IEEE Xplore, INFORMS PubsOnLine, JSTOR, ScienceDirect, SpringerLink, Taylor & Francis Online, Transportation Research Board's TRID, Web of Science, and Wiley Online Library. We used "carsharing" and "car sharing" as search keywords, and intensively analyzed the literature for relevance. Only literature in the English language and with a strong focus on commercial carsharing was considered; literature referring to peer-to-peer carsharing, corporate carsharing, carpooling, ridesharing, bikesharing, etc. was excluded (for example, for a literature review on bikesharing see Fishman, Washington, & Haworth, 2013). Second, a backward and a forward search was conducted. The backward search was carried out by reviewing the references of the identified articles, and the forward search was performed using Web of Science to find further literature citing the articles. We identified 130 articles from 26 different journals and 11 conferences, published from 1999–2014 (see Appendix 1 for a full list of the journals and the conferences along with the number of publications). Third, as we read each article, a concept matrix was compiled, identifying six key concepts in the field of carsharing research, i.e., market analysis, location, travel behavior, information systems, electric carsharing, and sustainability (see Appendix 2 for a detailed categorization of the literature in a compiled concept matrix). Thus, the review was structured by synthesizing the literature and discussing each identified concept.

The concepts help to understand the development of various research subjects with distinctive focal points (Figure 2). The findings of the literature review show that most of the articles address the market situation of carsharing services (59 articles). Further areas of interest include location considerations (41 articles), travel behavior (33 articles), information systems (18 articles), electric carsharing (18 articles), and sustainability (9 articles). With regard to the years 1999–2002, most of the articles analyzed the carsharing market – the other concepts were side issues at this point: while travel behavior, information systems, and electric carsharing had been of little concern, location and sustainability were not in focus at all.

success (Dixit & Rashidi, 2014; Shaheen & Cohen, 2007). For example, Zheng et al. (2009) report that people who are concerned about the costs of car ownership are more likely to join a carsharing program. For this reason, the most established carsharing providers supply services including fuel, insurance, maintenance, parking, etc. in order to offer cost and time incentives to members. On the other hand, environmental pollution, which is described as a car ownership disadvantage (Shaheen & Martin, 2010), can be reduced by deploying carsharing vehicles (Rabbitt & Ghosh, 2013). Carsharing can result in an overall reduction of cars and less driving, leading to a decrease of environmental pollution (Martin & Shaheen, 2011). Furthermore, the deployment of electric vehicles in carsharing services can additionally reduce environmental pollution. However, motives directly related to personal benefits like cost and time savings appear to be more present than motives with an indirect influence on consumers like the reduction of environmental pollution (Schaefers, 2013). Another incentive that has become more and more important in recent years is the **implementation of information systems (CSF10)**. Barth et al. (2004a) already stated in 2004 that the implementation of information systems is a critical success factor in the growth of carsharing services. Several other studies emphasize the importance of information systems (Kek et al., 2006; Kent & Dowling, 2013; Khanna & Venters, 2013; Shaheen, Meyn, & Wipyewski, 2003; Shaheen et al., 2009), which make carsharing services more user-friendly (Barth et al., 2004a; Clemente et al., 2013). With regard to established carsharing providers, internet- and smartphone-based reservations, mobile applications, smart card access to cars, onboard GPS navigation, etc. are essential to the carsharing program's success.

## 4. Conclusions and Outlook

In this paper, a literature review on the topic of carsharing was presented, which is considered as a transportation alternative to private car ownership. In order to address the first research question, a conceptual structuring of the topic was created, identifying 130 articles and 6 concepts: market analysis, location, travel behavior, information systems, electric carsharing, and sustainability. With respect to the second research question, critical success factors of carsharing services were derived from the literature review and discussed for implications.

The literature review is subject to the following limitations, which present useful opportunities for further research. First, the search was limited to relevant literature published from 1999–2014. The literature review provides a holistic extract of carsharing literature in the particular period of time to give an overview of the current research and has no claim to constitute the research field of carsharing in its entirety. However, earlier publications could be regarded. Besides, we encourage researchers to conduct further literature reviews for the next years to come, since carsharing is a growing trend in practice as well as in research. Second, exclusively literature in the English language dealing with commercial carsharing was considered for the review. For example, regarding peer-to-peer carsharing, worldwide growth is predicted (Shaheen & Cohen, 2013). Hence, literature from other carsharing-related fields such as peer-to-peer carsharing, corporate carsharing, carpooling, ridesharing, bikesharing, etc. could be taken into account. Literature in other languages might be of interest, as well. Third, we encourage researchers to more deeply consider the identified literature of the respective concepts in order to discover research gaps. The concept matrix in Appendix 2 will help to determine the articles that correspond to the concepts in the appropriate field of research interest. Fourth, we call for a deeper examination of the critical success factors. Since the factors were derived from the literature, we recommend further research to analyze the world's leading carsharing providers such as Zipcar and car2go in the context of the implementation of the success factors in their carsharing services. A validation of the factors by means of empirical analysis such as expert interviews and user surveys would provide new findings. Furthermore, the investigation of critical

success factors specifically for electric carsharing would also give new insights for carsharing providers that offer or plan to offer electric vehicles for carsharing services.

As carsharing services became more successful over the last several years, the topic proliferated in research, as well. With regard to the concept development of carsharing research (Figure 2), we expect a further increase in importance of carsharing research in general and a growth of interdisciplinarity of the topic in the future.

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