

Factors Affecting Customer Satisfaction of Carsharing and Development Direction: Analysis Based on Customer Perspective

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Abstract--In recent years, carsharing, as an effective method which may alleviate environmental pollution, tackle rising prices of fuel and meet the demand of expense economizing, while also has been widely concerned by the whole society. Customer satisfaction can reflect the past and present operation effect of an enterprise and its future financial situation. High customer satisfaction can win customers for an enterprise and help it be in a favorable position in the competition. This paper focuses on the study of customer satisfaction of one-way carsharing system, aiming to help carsharing organizations to clarify customer expectations and needs. By using SWOT Analysis and customer journey map analysis, the current research status in this field is summarized and the customer behaviours and touchpoints are explored. Through the analysis of the salient problems, the difficulty of parking and finding an available car are identified as a major obstacle to the development of shared cars. In summary, this paper looks forward to the future development of carsharing industry and proposes three ways to help carsharing enterprises to define development direction clearly, including establishing incentive mechanism, adopting advanced technology, and developing driverless technology.

Keywords--Carsharing, Customer satisfaction, SWOT analysis, Customer Journey Map

1 INTRODUCTION

The fast growth of private cars leads to myriad problems such as traffic congestion, a shortage of parking spaces, and emissions. Shared transportation is a reliable alternative, though it has many defects in terms of personalization and flexibility [1]. In this condition, carsharing model has attracted increasingly attention because its potential to lessen various conflict [2]. With increased mobility needs and flexibility, carsharing has become an alternative transportation option especially in metropolis. The carsharing model allows a single car to be used by several

individuals in different time slots. When people join a carsharing organization as users, they can use cars by paying the usage fee depending on the time used and/or the distance travelled, without the obligation of a purchase [3].

With the rapid growth of carsharing, a broad range of enterprises from highly varied sectors have started entering in the carsharing market, including car producers, insurance companies, transportation service providers, and energy companies [4]. Carsharing organizations operating throughout the world in various forms have sprung up. Ferrero, et al. found that 69% of the analyzed papers are referred to B2C (Business-to-Consumer) one-way mode [5]. B2C model here demonstrates that the ownership of the shared car belongs to the company. The one-way model allows customers to end their journey at the pickup station which can be different from the initial pick-up station. In this paper, we mainly discussed about B2C one-way mode to make the results more specific and provide constructive advice to the majority of organizations in the current market.

According to different research objects, the existing publication in the field of carsharing can be roughly divided into 4 aspects: the impact of carsharing system on the environment, market dynamics, daily operation management, and customer behavior [6]. By looking back on the last fifteen years of research, a research trend was found that the focus of carsharing topic had shifted from infrastructure design to dealing with the customer behaviors and the customer acceptance [5]. For carsharing, as a supplement to the transportation system, customer satisfaction is of greater significance. Because customer satisfaction research can assess the service quality perceived by users and evaluate whether carsharing meets the needs of users [7].

Therefore, the main contribution of this paper is twofold. The first contribution to current literature is that the internal and external factors affecting carsharing development have been identified. Second, by analyzing the process details of the customer's use of shared car, we have identified salient problems and put forward feasible suggestions for the future improvement and the development of B2C carsharing organizations.

This paper is structured as follows. Section 2 describes the methodological approach used in this paper. In Section 3, literature review on carsharing customer satisfaction would be present. In Section 4, carsharing customer satisfaction analysis is demonstrated through customer journey map. Finally, in Section 5, suggestions on the potential of carsharing operation optimization are provided.

2 RESEARCH METHODOLOGY

An inductive approach was employed to identify prior literature. To ensure proper quality, a specific topic that carsharing related to customer satisfaction was set before the collection. Articles that study carsharing user experience via questionnaire or interviewee would be sorted out and analyzed. The scope was limited to articles from peer-reviewed journals, conferences, Master Thesis and Doctoral Dissertation. Potentially relevant articles were identified using a keyword search with different combinations of the terms "car-sharing" or "carsharing" and "customer willingness to use" or "customer satisfaction". The rules for retrieving include: the same words in the title of the paper, the research content mentioned in the abstract are consistent with the research direction of this paper, the keywords are the same or similar, and the

conclusion expresses relevant opinions. This search was conducted in common databases, including Web of Science, Google Scholar, and China national knowledge infrastructure (CNKI). In order to get closer to the status quo of carsharing customer satisfaction, we searched the literature covering the period from 2015 to the end of March 2021. After reading all the collected studies, the main themes from these studies, such as the investigation data and the customer satisfaction index are extracted. In total, 20 relevant articles with concepts that fit into this certain topic were identified.

Next, SWOT Analysis was applied. SWOT Analysis is the acronym for "Strength", "Weakness", "Opportunity" and "Threat", which is a powerful tool used for strategic planning and management in organizations [8]. Obviously, SWOT Analysis is widely used in the carsharing journals. Abreu Medeiros deems SWOT Analysis as the foundation to identify the key elements to carsharing business analysis in Brazil [9]. SWOT Analysis was applied to describe the situation for a possible strategic positioning of self-driving cars in a carsharing model [10]. Nevertheless, from the perspective of the customer, SWOT Analysis related to carsharing has not yet appeared. We summarized customers' thoughts and voices from the literature we selected and finished the SWOT analysis. We desired to help organizational management to uncover opportunities and to take advantage.

Another tool, called customer journey map (CJM), would be used in the following section. CJM is a sketch map that illustrates the steps customers go through, which helps to understand how the company would like its customers and prospect's experiences to be [11]. The carsharing platform introduction and existing publication provided a rough outline of the process of using a vehicle through a B2C carsharing service. The various steps that make up the user's customer journey and touchpoints [12]. Through the data of customer satisfaction in the previous article we collected, we evaluate the customer's feelings for each step of carsharing experience process. From these findings, we hope to find opportunities for carsharing organizations and give some suggestions to improve their service to maximize profits.

Overall, by adopting these approaches, we believe that the results of our review could support B2C carsharing enterprises to seek the development way to attract more customers and gain more profits.

3 LITERATURE REVIEW ON CARSHARING CUSTOMER SATISFACTION

We selected a total of 20 qualified literatures. The author, date and investigation method are presented in the Table 1.

TABLE 1. SUMMARY OF SELECTED LITERATURES.

Author	Time	Investigation methods
Firnborn, & Müller [13]	2015	Take car2go users as the sample. 743 valid questionnaires were collected via the online survey.
Lerro [14]	2015	Of the total participants of the University that were reached via email, 1271 completed the survey.
Kim, Ko, & Park [15]	2015	533 valid participants' opinion were collected by sending questionnaires via email.
Pires [16]	2017	A total of 291 valid samples were collected from customers

		aged between 18 and 35.
Ampudia-Renuncio, Guirao, & Molina-Sanchez [17]	2018	The students of the Civil Engineering College are the research group. A total of 186 valid questionnaires were collected.
He [18]	2018	A total of 500 valid questionnaires were collected from carsharing users in Beijing, China.
Zheng [19]	2018	20 in-depth interviews were carried out.
Xu [20]	2018	449 valid questionnaires were collected via the online survey.
Ko, Ki, & Lee [21]	2019	A total of 1,981 questionnaires were selected as valid samples.
Zheng [22]	2019	Taking Gofun users in Wuhan, China as the survey objects. 310 valid questionnaires were collected.
Yin [23]	2019	301 valid questionnaires were collected via Likert scale.
Qin [24]	2019	Two rounds of questionnaires were put online. 215 valid questionnaires were collected.
Wang, Yu, & Meng [25]	2019	A total of 200 research samples were selected via questionnaires.
Huang, & Lin [26]	2019	Taking Gofun users in Hangzhou as the survey objects. 187 valid questionnaires were collected.
Elango, & Sukumaltakun [27]	2019	This research was conducted using focus group interview techniques. 4 focus groups, with 5-6 participants were formed.
Liu, Feng, & Zhang [28]	2020	792 valid questionnaires were collected via Likert scale.
Quyên [29]	2020	10 in-depth semi-structured interviews were carried out.
Bemmouna, & Alyousif [30]	2020	18 in-depth semi-structured interviews were conducted via online video chat application.
Acheampong, & Siiba [31]	2020	Taking young adults in Ghana as the objects. 449 valid questionnaires remained for analysis.
Li, Tang, & Li [32]	2021	212 samples were collected via the online survey.

We reorganized the viewpoints and data from the literature mentioned above to analyze the strengths, weaknesses, opportunities, and threats of carsharing. The collated results are shown in Figure 1.

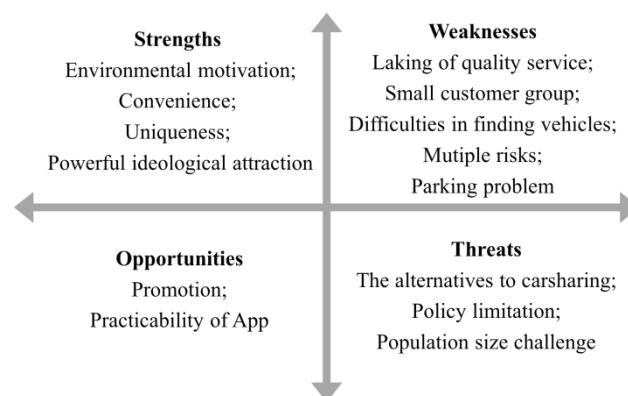


Fig. 1 Carsharing SWOT Analysis

3.1 Strengths

Four major advantages stand out in the literature. The advantage mentioned most was environmental motivations. Through empirical analysis of the questionnaire results, the author believes that there is a strong correlation between environmental impact and customer expectations [28]. Many respondents believe that carsharing can reduce environmental and overall concerns, as having this new mobility will reduce the need for personal vehicles [15]. Convenience is the second key advantage. 59 out of 291 respondents (20.3%) thought carsharing was easy to use [16]. Carsharing service not only makes users feel satisfied in the driving process, but also makes users feel very convenient in the payment process [32]. The uniqueness is one of the carsharing strengths. Carsharing provides value-added service that they cannot receive from other public transportations [29]. Carsharing can meet different travel purposes, which is a quality that public transport does not qualify. More than half (54%) and 47% of the respondents agree that carsharing would be suitable for work journeys and non-work journeys [31]. Powerful psychological attraction is also mentioned. A significant number of users are attracted by the novelty of carsharing [22]. Compared with the traditional way of travel, carsharing is novel and interesting. It inspires consumers' curiosity.

3.2 Weaknesses

The main weakness with carsharing is that the quality of service is always unsatisfactory. Since the carsharing market has not reached the mature development stage, there are immature problems in all aspects [28]. As a result, there is a big gap between customers' expectation of sharing cars and their actual perceptions. At the meantime, multiple risks are mentioned frequently. 64.5% of users expressed concern about the security. The main reasons for concern include damage to the hardware of vehicles caused by long-term operation and failure of carsharing companies to repair in time [20]. This situation had left customers skeptical about the safety of shared cars. Financial risks, such as deposit refunds, and the risk of disclosure of personal information are mentioned [32]. Moreover, in the vehicle experience perspective, there are two main problems of carsharing. On the one hand, it is hard to find available vehicles [14]. On the other hand, the problem of parking difficulty appears in many literature. Last but not least, all of the questionnaires collected demographic data. In addition to the research on specific subjects, one phenomenon that the main group of ride-sharing users is very concentrated had been found, one finding is that the main groups of carsharing users are very concentrated. The small customer group poses a threat to the development of carsharing. The willingness of men to use shared cars is much higher than that of women, and the willingness of people aged 26-35 to use shared cars is higher than that of other groups [19]. In a survey of users in Seoul, according to statistics, most respondents in the overall sample were male (83%) and under the age of 40 (89%) [21].

3.3 Opportunities

Promotion about carsharing and the practicability of App are the identifiable opportunities in the literature. In the promotion aspect, promotional activities from the service provider and its partners could help attract more users as well [27]. In the practicability of Carsharing App perspective, the practicability of APP is not the most important and urgent problem for consumers [18]. At present, consumers do not pay much attention to the usability of APP when using time-sharing rental, and the satisfaction of APP usability is not very high either. This

factor is in the area of opportunity, which may translate into an improvement area or an advantaged area in the future.

3.4 Threats

The biggest threat to carsharing is that there are many alternatives such as subway, bike-sharing, and walking. Carsharing consumers believe that if they use shared cars to be replaced other modes of travel for a long time, the cost of using a shared car should not exceed the cost of taking a taxi [25]. However, the current cost of using a shared car exceeds the psychological expectations of many customers. Most of the respondents considered carsharing uneconomical [14]. Satisfaction with carsharing billing rules and usage costs came in second to last [23]. The price disadvantage makes shared cars easy to replace. Second, there is a population size challenge. the population size can also be a challenge [29]. Because it is easier to obtain a critical mass if a private car has a bigger market size. Finally, policy restrictions have also been mentioned as a threat to carsharing. Taking Hangzhou, China as an example, in order to reduce the number of cars driven on the road every day, the government has set a limit on the driving days of each car based on the last number of the license plate [26].

We used SWOT to tease out customers' perceptions of carsharing. Next, we tried to use a carsharing customer journey map to show how these strengths and weaknesses affect customer satisfaction.

4 LITERATURE ANALYSIS ON CUSTOMER JOURNEY MAP

Seven steps identified that make up the carsharing customer journey. These steps can be divided into four phases: Discovery Phase, Ready-to-Use Phase, Use Phase, and Post-Use Phase. Theoretically, the Discovery Phase occurs only once, whereas Ready-to-Use, Use, and post-use cycles are cyclically reoccurring [14]. As shown in Figure 2, a flowchart of carsharing customer experience is presented.

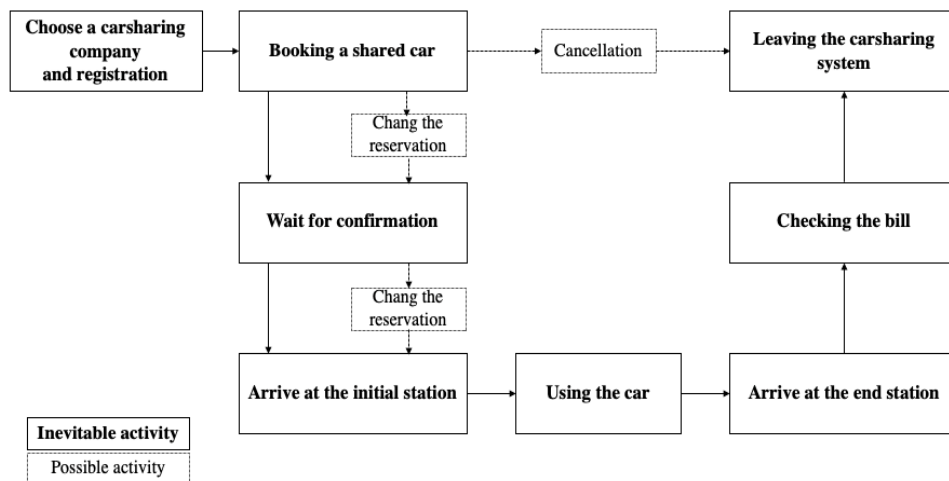






Fig. 2 Flowchart of customer using carsharing service

For the B2C carsharing customer journey map, please refer to Table 2. The building block “Actions” reveals insights into the behaviour of the users throughout their journey steps or touchpoints in terms of satisfying a mobility need [33]. We listed some customer needs and touchpoints that have been mentioned in some existing carsharing customer journey literature.

Sopjani highlighted four high touchpoints on the carsharing customer experience map [33]. Relied on this finding and the previous literature of customer surveys, we rated the customer feelings of each phase. In Discovery Phase, how to attract and motivate interested people to become experiencers is very important. Based on the current situation, the word-of-mouth publicity and news media reports on carsharing have attracted users and raised their expectations of use [28]. However, some users believe that the promotion channels of carsharing are limited [22]. And the enterprise propaganda is weak. Therefore, we believe that customer satisfaction at this stage is at a medium level. In the ready-to-use phase, finding and identify the reserved car is the most essential touchpoints. The customers feeling at this stage is not satisfactory. The difficulty of finding vehicles has been identified as a weakness in SWOT Analysis. Besides, 21.62% suffered a long reservation time because the response service was slow [21]. Some users thought the main difficulties are still focused on integrated services, such as online customer service, billing disputes, and incident reporting [25]. When traveling, parking the shared car is the key touchpoint. Actually, carsharing companies had done a terrible job. The problem of parking difficulty appears in many literature. For example, 19.9% of respondents reported parking difficulties [16]. Mover, the need for the information to corresponding to a physical car is clearly not being met.

TABLE 2. CARSHARING CUSTOMER JOURNEY MAP

Stages	Customer Behaviors		Customer Demands	Touchpoints	Feelings
	Steps	Action			
Discovery Phase	Research	Inquire information about carsharing company; Choose one of them	Easy to use service; Vehicle availability for use several times a day; Approachable information; Support service	Incentives for use; Access information in different channels; First impression	
	Planning	Plan time in advance; Sign-up; Confirm registration			
Ready-to-Use Phase	Booking	Check vehicle availability; Choose time; Book	Easy booking system; Book a car for longer time; Choice of various vehicle; Integrate the booking system with personal calendar	Easy default system; Easy access to shared car information; Responsive action	
	Pre-travel	Wait for confirmation	The car parked in nearby location;	Access the car easily;	

		(Noted that appointment changes or cancellations may occur.)	Info about car location; Service support contact info; Simple booking change/ cancellation option	Identify the booked car easily; Prior-booking reminder	
Use Phase	Ongoing process	Access/ Unlock the car; Check car status; Start engine	Easy of unlocking; The information corresponds to the physical car; Clean vehicle; Option for short time parking; Notification or reminder for time slot running out	Free of charge risk (overusing the service); Parking the car (short term or after use); Extended use, what about next user?	
Post-Use Phase	Parking	Arrive at desired location; Park; Lock the vehicle	Report of travel and mobility patterns; Encouraging feedback; Fast access service support in case of any arising issue	Visible info on the car status; Drop-off point (parking) clear instructions; Sharing of the service experience; Service support	
	Estimate	Give feedback via the app; Go to office and share the experience process			

Among the 20 interviewees, 43.24% of the users thought the shared cars were dirty and outdated [21]. We strongly believe that customer satisfaction is very low. At the end of the trip, communication feedback was flagged as the high touchpoints. A survey on the intention of continuous use found that part of carsharing users was willing to recommend friends and relatives to use shared cars [23]. Therefore, we think that the last stage of customer feeling is medium level. Overall, the car-sharing experience was not as good as expected.

For "bad experience" touchpoints, carsharing organizations have to do their best to fix the problem [22]. This is due to the fact that every "bad experience" touchpoint has the potential to lose users. User experience before and during use is the most urgent part where the service qualities need to be improved. In other words, finding ways to solve the difficulties of getting available vehicles and parking is the main priority for carsharing organizations. We found some reasons causing the obstacles in previous literature. There are three reasons why finding a car is difficult. First, shared cars in operation are not enough. 83.78% of respondents reported that the number of shared cars was small [19]. Customer satisfaction with the number of operation cars is quite low [23]. Second, the imbalance of vehicle stock caused the problem. It means that even if enough shared cars are put into operation, there will still be cases where customers won't be able to find available cars. Third, users thought it difficult to find a car because they were so far away from the available shared car. Ampudia-Renuncio, et al. point out that there are limits on the accepted maximum distance to an available car and the accepted maximum waiting time for an available car in a tolerable radius around the user's position [17]. In addition, there are some possible problems with technical support issues. When a large number of car rental APP users

are online, problems may occur in some APPs, such as positioning deviation, system crash, and interface failure to refresh, resulting in users' inability to find the car [23]. And two reasons for the difficulty of parking were found. One reason is the unreasonable location of the carsharing station. 47.88% of users were dissatisfied with the distribution of carsharing stations [20]. Most of the carsharing stations for borrowing and returning cars have a certain distance from users, which cannot meet their demand [26]. The lack of parking space results in the difficulty of parking. The Gofun carsharing parking lots are always occupied by private cars. Carsharing companies can solve these problems more effectively and improve customer satisfaction based on those pronounced conflicts. Consequently, we proposed the following recommendations:

First, in view of the imbalance of vehicle stock in the whole network, the carsharing company can establish an incentive mechanism that will encourage users to participate in the redistribution of vehicles. The incentive mechanism mainly includes issuing driving coupons to users and providing users with free driving time. Customers in different regions have different preferences for incentive methods. Carsharing companies need to provide targeted incentives.

Second, carsharing enterprises should adopt advanced technology to improve service quality. For example, scanning and imaging technology can help companies diagnose and collect car conditions and characteristic information through electromagnetic radiation which relies on detecting elements to sample the target ground objects. This kind of information can be used to assist in the analysis of the vehicle in the process of external damage meanwhile troubled cars will be found on time.

Third, driverless driving provides the possibility to solve variety subsistent problems. Once the driverless vehicle has been successfully developed and put into operation, after the user submits car application and information on the carsharing platform, the shared intelligent car will automatically drive to the specified place within a predetermined time. The problem of finding the reserved car will be solved. After completing the order, the car can automatically receive the next order, which will improve the efficiency of automobile use. The problem of tight parking spaces will also be solved.

5 CONCLUSION

Our literature review refers to 20 investigation results from clarifying the concept, presenting the status of carsharing, and pointing out some salient problems with external and internal conditions on customer perspective. Through analyzing customer behaviour, customer demands, touchpoints and customer feelings to demonstrate the problems, challenges, and the factors that affect customers' use of carsharing. The ability to solve safety problems, breaking even, and the difficulty of finding and returning vehicles can bring competitiveness to carsharing companies, which is directly related to improving customer satisfaction and customer loyalty. In the future, shared cars may develop in the direction of shared car robots, with the goal of energy saving and environmental protection, the development of high-efficiency and low-polluting new energy sources will allow driverless cars to be equipped with 5G (5th-generation) and AI (Artificial Intelligence) technology. Combined with the road condition information and big data, smart car could become a mobile data exchange terminal and provide a butler-style travel service for individuals. As a result, everyone's travel rights can be respected and they can freely enjoy the pleasure of travel.

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