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Car shared mobility services: development of quality measurement scales

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Dedications and acknowledgements

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Abstract

This work provides three different scales aimed to assess the perceived quality of the services included in the car-shared mobility industry: ride-hailing (RH), ride-sharing (RS), and car-sharing (CS) services.

The services considered have grown in Collaborative Consumption trend, basing their business on online platforms allowing the sharing of vehicles among users. Even if they share common features, they are characterized by specific characteristics and different providing models, involving distinct economic figures as well as peers' interactions typologies. The scope of this study is, therefore, to provide a multiple-services analysis aimed to highlight all these differences in order to investigate about the different factors affecting customers' perceived quality. The result of the analysis is the development of three different measurement scales able to capture the relevant dimensions specific for each mobility service.

The surveys have been sent to three samples of 61, 63 and 67 respondents for RH, RS and CS respectively and the data have been used to perform the validation processes of the scales. The scale proposed for RH services, called RH-scale, is composed by 15 items in 4 dimension, two referring to the interaction with the platform provider (Site organization, Economic) and two to the PSP and car perceived quality (Ride, Empathy). As concern the RS-scale, proposed for RS services, the structure proposed includes the same dimension with slight differences and a new quality dimension referring to the social interaction with the other users. The result is a scale of 20 items and 5 dimension: Site organization, Economic, Ride, Empathy and Social Interaction. As concern the scale proposed for CS services, named CS-scale, it is composed by 15 items and 5 dimension, 4 concerning the platform perceived quality (Site organization, Platform responsiveness, Legal Protection, Contact) and one related to the perceived quality of the physical assets (Tangibles).

This study aims to add new knowledge about the relevant factors affecting the perceived quality of the car-shared mobility services. Furthermore, the tools proposed might be useful for companies to support managers in the assessment of the quality level delivered, in the evaluation of customers' need and benchmarking activities and for customers, effective or potential, to achieve a general view of the service.

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Introduction

In the last decade, the continuous growth of information technologies and mobile advices, new platforms and application spreads, have led to the development of new type of consumption based on the collaboration and the interaction of customers generally labelled with Collaborative Consumption (CC).

CC traces its origins since 90s when early platform, such as eBay and PayPal created online marketplaces with global clientele. CC companies have grown rapidly, creating successful and profitable new providing models and increasing the number of customers till becoming international and profitable firms as Airbnb in short-accommodations sector, Blablacar, one of the most popular carpooling service or Uber and Lyft operating in international markets as well as eBay.

These examples of success companies proposed are solely the most relevant CC startups; nowadays different business have been developed affecting several sectors, from transportation, accommodation, crowdfunding or time banks, to social lending, cohousing or co-working. All these business are based on a peer-to-peer interaction mediated by a digital platform provided by a company such as a website or an online app which acts as "matchmaker", allowing the encounter of users, willing to make available a resource, with other ones seeking for it. These product-usage-systems allow the sharing of resources, owned by a private individual or by an organization, that can be both physical assets or not-physical goods as services, contents or skills. These resources are generally underused or not used at their maximum capacity and this leads to a co-generation of value which encloses companies as well as customers due the exploitation of the residual capacity and higher asset utilization rates. What differentiates CC from traditional consumption models is that, in this new trend, multiple people can have access to resources instead paying for an exclusive access to them. Collaborative consumption phenomenon has, therefore, led consumers to shift from consumption culture of owing to

a new one based on the access to resources, as rooms, cars and almost any type of goods has become a sort of commodity sold through a pay-for-usage service.

Business models based on the sharing have already existed in the past, for instance taxi transportation service accessible from multiple passengers or hotels short-term accommodations; the genius of the CC models and, therefore, the reason of their success and spread, are rooted in the use and matching of new technologies as smartphones, GPS, new payment, data storage and communication systems and identification and feedback mechanisms, that have led to a reduction of transaction costs and allowed almost anyone, with the right assets, to make it available and to anyone to access to several types of resource, anywhere, at any time and instantly. Technology developments have created the basis for a new ways of doing business allowing the achievement of a scale of consumers larger than before and allowing the creation of international, profitable and sustainable new models.

It is possible to understand how much these models have changed the customers' way of thinking, disrupting traditional business and creating new ones, challenging old businesses and crating new profitable enterprise opportunities in several industries. One of the most affected and emerging sector is the mobility in which new CC business have grows leading to a new phenomenon called *Sharing mobility* (SM). SM includes all those services in which vehicles (bicycles, automobiles, small aircraft, etc.) are accessed sequentially by multiple users on a pay-per-use basis. According to Shaheen et al. (2017), it could be defined as an "umbrella" which covers all innovative transportation modes with different use cases, business models, and travel behavior impacts (Shaheen et al; 2015). All these mobility services have shifted customers' preferences away from to own a vehicle to the simple access to a mobility service that they can pay at usage without costs of fuel, assurance and maintenance. In contrast with the traditional mobility service, SM provides customizable mobility options allowing customers to access to tailor-made transport facility according to their needs without fix times or routes. This is possible thanks the real-time interaction enabled by the platform provider which makes possible the continuous adaptability of the content of the services to customers' needs using new communication and information systems. Companies as Uber, Lyft, Zipcar, Blablacar or

Enjoy are ones of the most successful example of sharing mobility economies reaching an international clientele. All these businesses have changed the transportation industry leading to different benefits such a co-creation of value for companies and customers but also the urban mobility with socio-economic and environmental aids like assets' higher utilization rates as well as fleet's size reduction and renewal, pollution and traffic congestion decreases.

Sharing mobility, and CC in general, had led to a new consumption culture changing all the business rules and proposing new profitable models characterized by new features, economic figures and customers' interactions. For this reason, they have become a quoted subject for several entrepreneurs, financial experts, and retailers and several analyses have been proposed in different areas ranging from business, management, economy and environmental fields. Among them, quality service assessment has been one of the main area analyzed and many authors investigated on these new providing models questioning about the factors affecting customers' perceptions and behavior, stressing the necessity to develop new measurement scales able to capture all the new CC specificities. The past literature on CC quality assessment remains still young since the phenomenon is almost recent and only few works could be found analyzing the quality relevant factors in different industry contexts.

This study aims to add new knowledge to the literature concerning the quality assessment of CC businesses and it will investigated on the affecting factors of a specific groups of services operating in the sharing mobility industry: ride-hailing (RH), which provides on-demand ride services, ride-sharing (RS) allowing more customers to share a car-trip, and car-sharing (CS) which allows users to a short-term car-rent. The three mobility services considered share the same final proposal to provide a shared mobility service and they could be considered as alternatives for customers. Even if they have common features, these service are characterized by specific elements and different providing models, involving different economic figures as well as peers' interactions typologies. The scope of this study is, therefore, to highlight all these differences proposing an analysis of the service providing models and of the different factors affecting the perceived quality of each typology. The result will be the development of three different scale aimed to assess

the perceived quality of each specific typology of service. The study will be useful also for practitioners since it provides measurement tools valuable for companies' quality management activities supporting the evaluation of the outcome of customers expected and perceived service characteristics, the understanding of customers' needs and the assessment and benchmarking activities.

The structure of the work is organized as follow. In the first chapter, the review of the past literature about the quality assessment of CC service will be proposed in order to achieve a theoretical framework and to conceptualize the concept of quality. The second section will contain an analysis of the sharing mobility industry and of ride-hailing, ride-sharing and car-sharing services aimed to evaluate the general industry context and all the specific features of the services. The methodology used for the development of the three measurement scales will be explained in the third chapter and it will be followed by the presentation of the results of the data analyses in the fourth chapter. The fifth and sixth sections will contain an analysis of all the quality scores obtained for each service, aimed to provide business suggestions and a ranking of the quality dimensions, and the conclusions of the papers.

Chapter 1

Literature review

1.1 Literature review methodology

The review the previous literature has been made using the Web of Science database. The research has been carried out using the key words “sharing economy”, “collaborative consumption”, “sharing mobility” and “quality”, and it has included all the articles in English language, of the three last years (2017-2019),belonging to the first quarter of importance (Q1) and to the business, economic and management areas. The set of articles resulted by this research have been analyzed and all the ones relevant for the context have been considered. Other important articles, which do not fulfil the criteria of the research, for instance not included in the slot time, but considered relevant for topic considered, have been analyzed in order to reach a wider and complete theoretical framework.

The aim of this section is to achieve knowledge about the service quality assessment in order to provide a theoretical framework about the relevant characteristics and factors affecting customers’ perceptions and to conceptualize the concept of service quality. The findings of this research will support the development of the measurement scales on which this thesis is focused.

The literature review will be proposed in two subsections:

1. Service Quality: review of the past literature about the assessment of service quality and the principal measurement tools proposed.
2. Collaborative consumption services quality: review of the past literature about the conceptualization of collaborative consumption phenomenon and about the quality assessment of these typologies of service

1.2 Service quality

The pioneers of the quality assessment were Parasuraman, Zeithaml and Berry (1985, 1988, 1994) who proposed a model named SERVQUAL based on the comparing of

expectations and perceptions of customer of a service. Parasuraman et al. (1985) defined the concept of service quality referring to the degree and the direction of the discordance between customers' expectations and perceptions in terms of important factors that can affect their attitude in the future. After three years, the same authors described quality as "*the overall evaluation of a specific service firm that results from comparing that firm's performance with the customers general expectations of how firms in that industry should perform*" (Parasuraman et al., 1988). Parasuraman, Zeithaml and Berry (1988) introduced the SERVQUAL scale composed by five dimension and 22 items of Likert-type; each item included in SERVQUAL scale had two different functions, one to assess the expectations about the a service company in general included in an industry and the other to evaluate the perceptions related to the specific company whose quality had to be assessed and with which the customer has had an experience. The service quality (Q) was, in this model, calculated as the gap between expectations (E) and perceptions (P) as Q=E-P. The items measured five different quality dimensions:

1. Tangibles referring to the physical appearance of the facilities, equipment, workers and communication material.
2. Reliability referring to the capability to provide the promised service.
3. Responsiveness referring to the promptness to help customer and to provide the service.
4. Assurance referring to the employers' curtesy and their capability to convey confidence.
5. Empathy referring to the attention provided by the company to customers.

The authors of SERVQUAL suggested that this quality measurement instrument could be used for many activities such as tracking the quality trends over the time, compare a company to competitors and categorize customers' attitude basing on their individual SERVQUAL scores. This scale has been used in different socio-economic and geographical contexts and adapted to different services' industries like higher education institutions, airports, tourism sector, accounting firm and medical service (e.g. Buttle, 1996, Fick and Ritchie, 1991; Lam, Wong and Teung 1997; Lim and Tang, 2000,; Oldfield and Baron, 2000). Cronin and Taylor (1992) later controverted the framework proposed by Parasuraman et al. (1985, 1988) proposing a scale named SERVPERF based

on the measure of performances. The SERVPERF's propose was to directly capture customers' performance perceptions in comparison to their expectations of the service encounter. Based on these two frameworks, various scales have been proposed introducing new methods of collecting and processing customers data in order to overcome some of their limitations and practical aspects. *Qualitometro* framework, proposed by Franceschini and Rossetto, (1998), for instance, was based on the Parasuraman's scales and proposed a real-time assessment of quality in which the measurements of perceptions and expectations were made in two different moment, before the use of the service for the expectations and after the use of it for the perceptions, in order to lead the costumer to assess the quality through a direct comparison with the realty.

Although the existence of these different measurement methods, the most used instrument remained SERVQUAL and, even if it was developed in the half of 80s, it still quoted intensively nowadays. The scale became the object of and reviews, criticism and different empirical experimentations in order to investigate the effective capacity of measuring the quality perceptions of the costumers and to test the real consistency of the psychometric properties (Carman, 1990; Finn & Lamb, 1991). Asubonteng et al. (1996) undertook a critical review of SERVQUAL by reviewing the tests for validity and reliability and through the analysis of SERVQUAL applications studies in several industry contexts (health care, retail, banking, fast food restaurants, etc.), they concluded that SERVQUAL scored well for reliability face validity and concurrent validity but found little proof for convergent validity.

Some limitations of these measurement instrument have born in the last decade of the century, when internet developments and the spread of new technologies have led companies to provide services entirely online. In recent years, the well acknowledged connection between service quality and business performance has increased the interest in e-service quality (Rowley, 2006) and several researchers have focused on it and on the quality assessment of these typologies of new service. Some authors provided a conceptualization of e-quality referring to "*all services delivered via an electronic medium (usually the internet) and comprising transactions initiated and largely controlled by the customer*" (Colby and Parasuraman, 2003) or about the e-quality

describing it as "*the extent to which a Web site facilitates the efficient and effective shopping, purchasing and delivery*" (Zeithaml et al., 2002). Services provided online are different from traditional models where customers interact with the organization using their senses since the interaction occurs online through a web site (Rowley, 2006). The spread of e-services and the development of new services providing models led to the need to redesign the concept of quality assessment. One of the most important effort in the e-quality service assessment was given by Parasuraman, Zeithaml & Malhotra in 2005 with the proposal of the ES-QUAL (Parasuraman et al., 2005), a scale aimed to assess the e-services quality. The scale proposed was composed by 22 items and four quality factors:

- Efficiency: the ability of the customers to get to the Web site, find their desired product and associated information, and check out with minimal effort. Efficiency is considered very important in e-commerce in which the time saving, and the convenience are one of the main drivers leading customer to shopping online (Ranganathan and Ganapathy, 2002).
- Fulfillment: the accuracy of service promises, having products in stock, and delivering the products in the promised time (Parasuraman et al., 2005), It is one a very important factor in the measurement of the quality of an e-commerce system since customers' satisfaction or dissatisfaction depends on keeping service promises and on the accurate fulfillment of the orders (Yang and Fang, 2004).
- System availability: the correct functioning of the website by a technical point of view. Customers' purchase on an online shop and attitude are strongly affected by the correct site performing due function problems, such as non-working buttons, could lead the customers to decide to exit and this could lead companies to decrease customers' loyalty. (Wachter, 2002).
- Privacy.: the care that the websites takes with personal data. This dimension refers to the degree of safety and protection of the website of customers' personal information. Privacy has been shown to strongly affects intention to purchase of customers (e.g. Loiacono et al., 2002), customer satisfaction (e.g. Szymanski and Hise, 2000) and overall site quality (e.g. Yoo and Donthu, 2001) so it is very important to ensure a high level of information protection.

Parasuraman et al. (2005) also proposed E-RecS-QUAL, a complementary scale aimed to assess the impacts that the problems encountered during the online transaction had on the perceived e-quality. The scale proposed was composed by three dimensions, responsiveness, compensation and contact, and it may be used in case of questions o problems encountered by customers. Many authors of the previous literature questioned about the relevant e-quality factors and its assessment focusing on the interaction established between the final customers and the website. Some instances are WebQuale scale proposed by Loiacono et al. (2002), aimed to assess the interface of a website, or SITEQUAL instrument developed by Yoo and Donthu (2001) assessing traditional e-service.

E-S-QUAL remains today still quoted and several adaptation of the scale in different geographical contexts, ranging from the music content sharing, banking job portal, books stores or travel agency (e.g. Bernando et al. 2012; Berbegal-Mirabent et al., 2016) have been developed. This scale could be used, therefore, as a general instrument to assess the quality of any e-service's typologies, capturing both online and offline features (Marimon et al., 2019).

1.3 Collaborative consumption services quality

Collaborative consumption (CC) is a concept used to refer to a new type of exchange or "collective exchange" (Benoit et al., 2017) in which the economic actors are more consumers "*seeking access to goods or services provided by a peer service provider*" (Bardhi & Eckhardt,2012, Belk, 2014). Although the most common label used is collaborative consumption, various tags has been provided by scholars from different disciplines for instance access-based consumption (e.g.,Bardhi & Eckhardt, 2012), access-based service (e.g., Schaefers, Wittkowski, Benoit, & Ferraro, 2016), non-ownership services (e.g., Wittkowski, Moeller, & Wirtz, 2013), commercial sharing programs (Lamberton & Rose, 2012), two-sided markets (Rochet & Tirole, 2006) or share economy or sharing economy (e.g., Hamari, Sjöklint, & Ukkonen, 2016). In the previous literature numerous definitions could also be found to describe CC economic phenomenon without a unique universal and recognized-by-all description. For instance, according to Hamari et al. (2016), it can be defined a "*peer-to-peer based activity of obtaining, giving, or sharing access to goods and services, coordinated through*

community-based online services". The authors developed this definition by mapping almost 250 CC websites of different business and industries and categorized it as a technological phenomenon. Another previous authours described CC referring only to non-monetary transactions as "*the acquisition and distribution of a resource for a fee or other compensation*" (Belk et. al, 2014). However, this is where the definitions diverge based on whether monetary exchange is allowed as a part of CC.

Collaborative consumption is based on the sharing resources among customers who make these resources available and others who seeking access for them. Business models based on the sharing of resources have existed for decades, such hotels providing short accommodation or the sharing of vehicles of taxi services; what differentiates CC from these models, is the exploitation of new technologies which have which have simplified the sharing of both physical and nonphysical goods and services based on the availability of various information systems on the Internet (Hamari et al., 2016). The matching of these new technologies have led to the constitution of online-based communities and network, decreasing transaction costs as well as creating online platforms that promote user-generated content, sharing, and collaboration. (Mohlaman, 2015, Kaplan & Haenlein, 2010). New technologies have allowed to improve information and communication systems leading to an efficient and instantly matching of supply and demand which encounter is mediated by a digital platform provided by the company such as a website or an online application. Customers, in this way, can access to any type of resources made available by a peer by anywhere and anytime. CC services fall into several operating models such open source, online collaboration, file sharing or peer-to-peer financing. Most of the CC models common way are based on an access over ownership (Hamari et al., 2016) which means that "*a customer offers and shares a resources with other users for a limited slot time through a peer-to-peer sharing activity such as renting and lending*" (Bardhi & Eckhardt, 2012). Alternatively, some models allows the transfer of ownership from one user to another through swapping, donating, and purchasing of primarily second-hand goods (Hamari et al., 2016).

Although different business models exists in several industry, CC service share common characteristics. According to Benoit et al., 2017 three main criteria distinguish CC models from the others:

- the number and type of the actors involved: CC is characterized by a triad rather than the traditional dyadic enclosing a platform provider which enables exchange, a final customer looking for an access to the assets and finally a peer service provider who provides the access.
- The nature of the exchange: CC is characterized by the absence of an exchange of ownership, but the owner of the asset gives temporary property rights to the other users (Haase & Kleinaltenkamp, 2010).
- The directness of exchange: CC is mediated by a market mechanism while other related activities such as sharing, non-ownership or access-based services, buying or renting activities are not mediated by a market mechanism or they are mediated but they don't respect the other two criteria.

According to this findings, CC is characterized by a triad exchange involving the platform, a peer service provider and a costumer seeking access to goods or services. This model allows the final costumer to interact with the platform provider, through an online contact, and with the peer server or supplier whose relationship occurs both on- and off-line. The final user could interact with other users sometime directly (peer-to-peer) or indirectly since many CC companies promote themselves as social communities (Botsman & Capelin, 2016). The relationship between customers is a very important CC aspect cause users' service expectations are built often based on the information about the experiences of other costumers. Feedbacks, in this view, influences customers' behavior and the platform's reputation too and it is why reliability of these information is an important factor. In fact, people may doubt the ratings' veracity and may think that feedbacks are filtered in order to give a positive service-provider imagine. The rating system could become a sort of good behavior driver increasing customers' confidence in the platform. For example, if an Uber driver receives always bad reviews or an Airbnb host is always link to bad experiences, he/her is indirectly excluded since no one will transact with him/her, and this leads a peer to engage and to create a more reliable web of peers in long term. In general, it is this peer-to-peer interaction that drives the "community" aspect of CC valued by many consumers and peer providers (Habibi et al., 2016). The sense of belonging to a community or general the social issue is another important CC topic and many authors have stated the importance of the social bond. For

instance, Benoit et al. (2017) stated that social motives are ones of the main factor affecting users' participation in sharing economy, as well as, other authors highlighted the general importance of social utility as driver of the use of collaborative consumption services (Habibi, Kim, & Laroche, 2016; Ozanne & Ozanne, 2011) and the relevance of social networking (e.g. Barnes & Mattsson, 2016). Many online sharing economy platform, in fact, often propose themselves as an emerging social service in which the connection between users who do not know each other is made possible; for instance, Airb&B, allow customers to temporarily rent apartments or rooms made accessible by other users and proposes itself as community-driven hospitality company with the aim to allow encounters between users providing an authentic service experience (Botsman & Capelin, 2016). Another example is Blablacar, in which strangers could share the same ride, that focuses on providing a social experience as well as a mobility service.

Nowadays, several successful CC providing models and applications exist ranging several industries, socio-economic context geographical contexts and allowing the sharing of several types of services, goods and resources. Among these several CC subsector, one of the most emerging CC industry in terms of size and popularity is the transportation one including all those the services which allows multiple users to access to shared vehicles. This phenomenon, generally labelled with Sharing mobility (SM), includes B2C vehicle-sharing or C2C vehicle-sharing, and several different business as bike-sharing, car-sharing, scooter-sharing and other typologies as ride-sharing or ride-hailing allowing customer to share a ride. SM platform shares the same characteristics of CC one and it connects peers who seek to access to a transportation service with other peers who make possible the access to the shared asset, the vehicle. As the wider phenomenon of collaborative consumption, SM phenomenon is young and only some authors have discussed this topic and developed quality assessment scales. Among these, for instance, Möhlmann (2015) focused on the determinants of choosing a sharing option taking as case studies Car2go, one of the most famous B2C car-sharing company. The findings of the work were that satisfaction and the likelihood of choosing a sharing option again to be predominantly explained by determinants serving users' self-benefit and factors as utility, trust, cost savings, and familiarity with the service and community belonging were key factors. Boateng at al. (2019) analyzed in his work the determinants of consumers' intentions to participate in the sharing economy examining the factors

driving customers to use Uber, a most known ride-hailing platform. The authors investigated about five different driven factors:

- Consumer need for prestige: the social value of associating oneself with a product or a service and represents what the important others (Nasution and Mavondo, 2008)
- Trust: riders' belief that Uber is safer, robbery-free and secure (Boateng et al., 2019).
- Social connection: customers' enjoyment emotional benefits from the interactions they developed using the service (Boateng et al., 2019).
- Customer return on investment: the investment of financial, temporal, behavioral, and psychological resources that potentially yield a return to the customers (Mathwick et al., 2001)
- Search convenience: the speed and ease with which consumers can reach a driver (Boateng et al., 2019).

The findings of Boateng's work were that customers' behavior is affected by trust, customer return on investment and search convenience while consumers' need for prestige and social connection didn't play a significant role. Also Lee et al. (2018) analyzed the inhibiting, motivating, and technological factors on users' intention to participate in CC focusing on the specific case of Uber too finding that the perceived risks (privacy and security risk) and benefits (enjoyment), trust in the platform, and perceived platform qualities significantly affected the intention to participate . Cheng et al. (2018) proposed in his empirical work a scale for quality measurement in CC, specifically for the Chinese mobile ride-hailing service based on the analysis of both offline and online factors affecting the intention to participate of customers. The author and his team found as online important factors the congruity between the online descriptions and the information showed offline and the drivers' professional and empathetic competences; as concern the offline quality service, they identified structural assurance, related to all the guarantees, regulations, promises, legal recourse placed to guarantee the business process (McKnight, Choudhury, & Kacmar, 2002), and platform responsiveness refers to the willingness of a platform to help customers and to provide real-time services (Cheng et al., 2018). Other works could be found proposing measurement tools related to the transport industry (e.g. Bardhi & Eckhardt, 2012; Belk, 2014; Choen & Kietzman, 2014; Schaerfers et al., 2016) in which Uber company in frequently analyzed.

Sharing mobility services and, generally CC ones, therefore differs from the previous traditional on-line services models which require only B2C interaction in which a company's provides services to a customer. CC models, in fact, mixes both B2C model, referring to the encounter between customers and platform, and C2C one, as concern the interaction between customers belongs to this typology. This leads to the necessity to develop new measurement quality scales, based not just on the merging of online and offline dimensions proposed for the assessment traditional e-commerce services; CC services involve, in fact, new figures and new interactions and the factor affecting customers' attitude and participation are completely different. These new scale should be tailor made and developed ex-novo in order to capture the complexity of these models, merging both online and offline features, assessing all the customers' interactions and capturing all the specific aspects related to this new consumption culture.

RH-scale, RS-scale and CS-scale will be developed supported by this ideology and their structures will be based on both the past literature and the examination of the specific industry contexts, focusing on both online and offline features affecting the customers' perceptions on the perceived quality.

Chapter 2

Sharing mobility

2.1 Sharing mobility industry

Sharing mobility (SM) refers to all the transportation services shared among users. The phenomenon encloses a variety of options from services in which the vehicle itself is shared, several forms of car sharing ranging as station based to free-floating, as well as the sharing of scoters and bikes, to services allowing the share of the ride. According to Shaheen et al. (2017), shared mobility could also be defined as a transportation strategy that enables users to gain short-term access to transportation modes on an "as-needed" basis (Shaheen et al., 2015).

Although these mobility models have existed for decades, for example car rental, taxis and public transport, recent advancement of information and communication technologies have made these businesses possible at scale level. The difference of these new services is that the developments in technology as well as more accurate GPS, payment and identification systems, feedback mechanisms and smarter devices have allowed the instant matching of supply and demand and have make them much more accessible and convenient and tailored made for customers' needs. The convergence of these different technological advances has made possible to improve existing services and offer new flexible services, allowing customers to choose between a wider range of vehicle models, to obtain on-demand an instant access to a mobility service everywhere using a smartphone interface, without all the responsibilities and costs linked to the owing of a personal vehicle. The advantages of sharing mobility for customers are, in fact, substantially the disadvantages of owing a personal vehicle as maintenance and repair costs and issues related to parking and responsibility. The benefits of this models concerns also social and environmental issues as the reduction of pollution and the waste of resources, traffic congestion, sustainable energy as the electrical vehicles.

Within this framework, the concept of "Mobility as a Service" (MaaS) in now emerging and it refers to these services which combine different transportation modes as an

aggregator of mobility selling several services through a single smartphone app. Although the new phenomenon is leading to the thinning of the different transport modes' boundaries, shared mobility industry encloses different services and business models which provides various modes of transport. The fist classification of these services could be done considering the type of vehicle shared and, therefore, the sharing of bikes, motors, scoters and cars. These categories, in their turn, could be divided by considering the specific offer proposed ad different models, luxury or less luxury, electrical or not and faster or less fast vehicles. Even if any form of service providing shared vehicles among users could be counted as shared mobility, the analysis focuses on the emerging car-shared mobility industry (CSM) in which the asset shared among users is a car.

2.2 Car-shared mobility services

Services included in the definition of the car-shared mobility (CSM) provide a mobility solution to customers in which the asset shared by users is a car. This type of mobility services shares the same features of collaborative consumption models. In fact, according to Benoit's triadic (Benoit et. al, 2017), a generic CSM service involves:

- a final customer who requires access to a specific asset that is, in this case, a car.
- the peer service provider (PSP) who gives access to a car and delivers the service to customers.
- the platform provider which supplies the online marketplace for the service and makes possible the matching between customers and PSPs.

In this industry, the operating services could be classified into three categories of different business models and, specifically three different models could be found:

1. ride-hailing (RH) service,
2. ride-sharing (RS) service,
3. car-sharing (CS) service.

The analysis of these different models will be proposed assessing the actions and specific features of the Benoit's triadic and so, of final customer, peer service provider (PSP) and the platform.

1. Ride-hailing services

Ride-hailing (RH), or ride-sourcing, refers to a shared mobility service provided by an unlicensed taxy and it allows passengers, seeking for a ride, to connect with drivers using a mobile app. The model is equal to this of taxi service but, in this case, no license is needed for drivers who are private individuals using their own cars and the matching with potential passengers is managed by an online platform.

- RH users

Though the smartphone, potential users can insert the destination they would reach, view divers' personal data (usually name, average rating score) and information about the trip (route, price), and proceed to book a ride. Once a passenger asks for a ride virtually, the GPS location is sent to the driver who knows the exact position and proceeds to pick up him/her. The use of the online application also allows customers to track the location of their rides, to manage payments and transact or view reviews about the drivers made by other users and share their own ones.

- RH Peer Service Provider

The peer service provider (PSP) is the figure who delivers the service and it is identified in ride-hailing model with the driver. The RH driver is a user who accesses to the service by using an interface different form the user's one. In contrast with traditional taxi drivers, RH PSPs are not professional employers and almost anyone with an own car and a driving license could register him/herself in the platform and provide a ride to the users. Generally, RH platforms develop a ratings system thought which final customers could rate the service delivered and the driver. The average rating drivers and their personal information (name, age) are visible to potential riders in order to allow expectations about the future experience. In this way, bad drivers are directly, by the platform provider, or indirectly, due riders don't accept to have a ride with them, excluded by the service. Driver's aims are, in fact, to serve final customers in the best way, showing professionalism, empathy and benevolence to passengers.

- RH Platform

The platform provider aims to connect the final customer who requests for a ride with the PSP, identified in the driver who makes available the access to the car. Its scope is to provide an instant matching between the economic figures involved and to provide

assistance to both customers and driver. RH platforms should, in this view, care about all the important aspect affecting customers' perceptions, such providing a high performed online application to access to the service, a safe environmental in which transact, caring about users' problems and complaints and about personal information's protection.

To summarize, ride-hailing model provides a ride service, including both car and driver; the platform provider aims to connect the final customer who requests for a ride with the PSP, identified in the driver who makes available the access to the car.

2. Ride-sharing services

Ride-sharing (RS), or carpooling, provides a mobility service in which a group of passengers could share a car trip with the main aim of reducing transport costs. RS platforms allows the connection between potential passengers, seeking for a mobility service, and driver, who wants to fill in empty sits in their car, heading in the same direction.

- RS User

RS customers can access to the service by using an online application/website provided by the company. Potential and effective users could insert the starting point and the destination of route to be flown by the an interface of the website/app, view all the available routes published, their price and drivers' and passengers' personal data as the average scores and comments shared by other users and manage all the transactions. RS users seek for a mobility service as well as a social experience in which meet new people with who spent a pleasant travelling time. In fact, RS users share a trip with people they don't now and, in this context, he roles of trust and reliability of the information shared because they affect principally customers' attitude. A RS passenger should trust the platform and the information shared before accepting to share a ride with strangers. Customers' expectations are based, in fact, on the information viewable by the platform, about the past experiences of other customers and the ratings and comments given by the riders.

- RS Peer Service Provider

RS peer service providers are identified in the drivers who deliver the ride and make available the access to the shared-journeys. Unlike the ride-hailing, the drivers are not

"for hire" but they are private individual who posted, through an online app or website, the route they will do, the number of empty sits they would to fill in and the price per person; PSPs register them self in the RS platform sharing their personal data and information of the trip for which they are seeking passengers. The main driver of PSPs participation in RS is the sharing the travelling costs (motorway, fuel etc.) that would otherwise paid in full. The price proposed expects to be the part of the price resulted from the division between all the passengers.

- RS Platform

RS platform matches drivers with an own car seeking to fill empty seats in a journey and passengers who are looking to get a ride to the same destination. The main intent of these services is focused on living the experience of sharing a ride with people, developing new relationships and meeting new people. For instance, Blablacar, one of the most know ride-sharing company, makes social encounters the main slogan of its business. In this context it is possible to understand how trust and reliability play critical roles for RS business. Both passengers and drivers, in fact, should trust the company and the service before deciding to share a ride with people they don't know who are, essentially, strangers. The sharing of reliable ratings and comments and the development of reliable information system though the app are important aspects the platform providers should care about in order to instill trust in all the users, both potential and effective. RS companies' main aims are to provide an instant matching and an efficient online application/website though which access to the service and transact, instill trust and reliability, and to care about users complains or request by supporting them and provide assistance.

Ride-sharing model, therefore, aims to provide a ride including car and driver; the final customer is the figure who requests a sit in the shared vehicle, the PSP is the driver who makes available the access to the car and their matching is managed by the platform provider.

3. Car-sharing services

Car-sharing (CS) refers to mobility services in which users can book and access a car and drive it using an application provided by a platform provider company. Unlike the ride-hailing and ride-sharing, the shared cars are directly driven by users who pay a usage fee usually based on time or on the distance travelled. Services included in car-sharing

industry have different business models; for instance, they exist B2B car-sharing provided by a company for companies, B2C in which the CS firm provides a car park to be rent by everyone and C2C or Peer-to-peer (P2P) car-sharing that is similar to B2C but the private cars are made available by private individuals. Other differences could be found in the way to provide the service as free-floating way, a more flexible CS in which customers could pick-up and park the car where they want or station based model in which there are specific parking stations in the city in which the cars have to be taken and parked.

- CS User

The registered members use an online application or website to access to the service, to locate on a map available on the website/app all the available cars nearby, reach the car they would rent and manage all the transactions. Customers reach the cars using the app and the can start the rent and enter in the car using directly the smartphone or a RFID car. A technological equipment is installed on the car including GPS, systems allowing to start and end the rent automatically and to storage all rent data.

- CS Peer Service Provider

The peer service provider, as the private individual who makes available the access to the car, is present only in one CS model, the P2P one. In fact, while in the P2P models the PSPs are identified in the owners of cars, in all the other models, B2B and B2C, this figure is not present since the car park is owned and manage by an organization. In other to develop a measurement tool aimed to assess the quality of this service, adaptable for each typology of car-sharing, the figure of the PSP won't be considered.

- CS Platform

CS platform provides' aim is to provide access to rentable cars by matching instantly individuals who are seeking for a vehicle with the shared cars. The CS companies should care about the physical appearance of the cars, their visual appealing, maintenance, comfort and cleanliness and about the app/website performances, the legal structures provided, the reliability of the information shared and they should allow customers to ease access to the cars concerning about the efficiency of the technological equipment installed on the vehicles.

CS, therefore, provides cars to be rent and the final customer is the figure who rents temporarily the vehicle. The matching between the vehicles and the users is managed by

the platform provider and the access to the service is possible using an online app. As said, the PSP figure is present only in the specific P2P business configuration and not in the others.

The three typologies of services share the same goal to provide a mobility service using vehicles shared by more users. Although the main proposal is equal, the services provided are slightly different. For instance, ride-hailing and ride-sharing provide a "shared-ride" service, including a driver and a car while the car-sharing's offer is limited only to the physical asset driven directly by the users. Other differences could be found considering the utility of the final service for customers; in fact, both ride-hailing and car-sharing services' aim is generally to allow customers to move from one point to another of the same city while ride-sharing users could join also longer trips from a city to another. Furthermore, ride-sharing differs from the other two categories since it allows more users who don't know each other to meet and share a trip and it is reflected in a social experience. The interactions involved the final customer are different in each specific service context; in fact RH and RS users interact with the company, the app, the vehicle but also with the driver, figure that is not present in the carsharing.
All these differences meant that the customers' satisfaction and the perceptions of service quality are, therefore, affected by different factors and in a different way. This is why the measurement of the quality have to be a result of a specific analysis of the type of service and, for each of the three types of service considered, the scale has to be tailored made, including all the factors and aspects specific for each different context.

In the next section (chapter 4), the methodology used to develop the three different scales, called RH-scale, RS-scale and CS- scale for ride-hailing, ride-sharing and car-sharing respectively, will be proposed.

Chapter 3

Methodology

3.1 Introduction to the methodology used

The assessment of the service quality requires a complex analysis linked not only to a single dimension but to different aspects in order to achieve a broader view which encloses all the factors affecting the consumers' perceptions. According to the previous literature, the quality assessment refers to customers' perceptions and expectations and it encloses all the aspects (or quality dimensions) for which clients have expectations because this makes them critical and important. The approach used by European Foundation for Quality Management (EFQM) to quality, for instance, has as starting point all those aspects of a service which involves in needs or requirements and the concept of quality is closely linked to those companies which succeed in meeting or exceeding customers' expectations.

The service quality is a complex multifactor construct in which a global vision on different dimensions is needed. By the review of the past literature, as discussed in the previous chapter (chapter 1), the past works concerning the quality assessment of service in the specific sharing mobility field are few and only some works could be found (e.g. Möhlmann, 2015, Boateng at al., 2018, Cheng et al., 2018, Lee at al., 2018). Among all the works concerning this topic, the theoretical framework chosen for the development of the three scales is the scale proposed by Marimon and his team in 2018 called CC-qual (Marimon et al., 2019) which aimed to evaluate and measure the perceived quality of a general service of collaborative consumption (CC). The first reason of this choice is that the authors intended to create a validated, flexible and adaptable instrument able to be used in every sector and typology of service and companies of the collaborative consumption and, therefore, for also suitable for *car shared mobility (CSM)* sector. The second reason is that the theoretical framework used by Marimon and his team for the instrument is based on the both the scales proposed by Parasuraman, SERVQUAL and E-S-qual, scales largely applied in several industries and adapted in order to be suitable

to different service typologies and geographical contexts; furthermore, it is been stated and proved that these instruments include all the critical dimensions for the assessment of the quality and for the achieving of business aims (Ladhari, 2008; Ladhari, 2009; Loiacono, Watson & Goodhue, 2002; McKinney, Yoon & Zahedi, 2002).

The CC-Qual instrument was developed in order to be a generic scale to be used by any provider of a CC-service operating in any sector of the CC industry. The final version of the CC-scale consisted of 21 items grouped into 5 dimensions:

- Site organization: design of the site that makes it appealing and easy to browse.
- Platform responsiveness and agility: quickness to deal with and to establish agreements.
- Legal Protection and trustworthiness: Privacy and legal protection and reliability and honesty of the published information.
- Peer service provider: professionalism, honesty and empathy of the peer service provider.
- Social interaction: experience lived in interacting with people (including other users and the peer provider).

The authors' approach was to merge bot online and offline quality dimensions in order to assess CC services seen as "hybrid services" needed of both technological and human support. In fact, as it is possible to note, the first three dimensions are related to characteristics of the website or app that the final consumer use to access to the service while the last two ones, peer service provider and social interaction assess the interaction of the customer with the other peers, both peer service provider and users.

3.2 Proposal of Ride-hailing, ride-sharing and car-sharing scales

In order to define the construct's domain of the quality assessment of three measurement scales, all the quality dimensions affecting the perceptions of customers will be analyzed. RH, RS and CS have, as said, common characteristics and differences and the quality factors affecting customer's perceptions are different.

In order to define a set of relevant dimensions for each scale, all the possible interactions involving the final customer in using the service and all the aspects related to them have to be analyzed since they are directly linked to the quality perceptions.

The possible interactions the customer could establish using a generic CSM service, considering ride-hailing, ride-sharing and car-sharing, are:

1. Interaction with the platform.

   This interaction refers to the encounter with the online platform provided by the company as the website or an online app. In each of the three typology of service considered, customers interact with the platform the access to the service is through it and, therefore, all the quality relevant areas related to this need to be analyzed and assessed by each service-scales.

2. Interaction with the Peer Service Provider (PSP).

   The PSP is a private individual who, in CSM context, gives access to a car. This figure coincides, in ride-hailing and ride-sharing, with the driver who provides the ride for the final customer and the contact between customers with the PSPs takes palce, in these cases, directly. As concern car-sharing, as stated before, the figure of PSP is present only in the P2P model but not in all the others (B2B, B2C). For this reason, the interaction with the PSP has not to be considered relevant for a generic car-sharing service since it is present only in a specific configuration of the service.

3. Interaction with the car

   The interaction with the physical assets is, for definition of car-shared mobility service, a common features and relevant for each service included in the CSM industry. In fact, in each type of service, the final customer interacts with the car, as a passenger in ride-hailing and ride-sharing or as a driver it in the case of car-sharing. All the quality aspects and dimensions related to the interaction of the customers with the shared cars might be analyzed and assessed by all the three scales since this interaction is relevant for any CSM service.

4. Interaction with other users

   The interaction with other users refers to the social encounters the final customer has with the other peers (PSPs or other customers) by using the service. This interaction is certainly important and critical in the case of ride-sharing in which customers, who don't know each other, join the same vehicle and they are directly in contact. The social interactions between users is supposed to be one of the main reasons affecting RS customers' participation in the service who seeking for a social experience as well as a mobility service. In the case of ride-hailing and car-sharing, instead, the encounter

between users doesn't occur directly and the customers are driven mainly by utilitarian reasons and not by social ones.

The table 3.1 reports a summary of the previous considerations about which are the important interactions in the three service cases.

Interaction of customers	Ride-hailing	Ride-sharing	Car-sharing
Platform	V	V	V
Peer service Provider (PSP)	V	V	
Car	V	V	V
Other users		V	

Table 3.1: relevant interactions of customers (with the platform, PSP, car and other users) for each type of service (ride-hailing, ride-sharing and car-sharing).

As it is possible to note, the interactions established by customers are different for each typology of service considered. The nature of the services analyzed lead, therefore, to the need of developing three different surveys able to capture all the dimension specific for each service. For each type of service, the domains analyzed will be related to the specific interactions the customer has using that typology of service and for each interaction, a set of important quality dimensions will be proposed supported by the previous literature.

In the previous sections (3.2.1, 3.2.2, 3.2.3), an analysis of the three quality domains will be proposed for each typology of service and a set of relevant dimensions and items for each scale will be proposed as a result of the considerations based on the nature of the specific service and supported by the past literature.

3.2.1 RH-scale proposal

For the development of the RH-scale, the domains that will be analyzed are related to the possible interaction a customer could established using the service: with the platform, with the peer service provider and with the vehicle.

For each of these interactions, a set of relevant dimensions and items will be proposed aimed to assess all the important factors affecting the quality perceived quality of customers.

1. RH Platform perceived quality dimensions

As concern the interaction with the platform, the first dimension considered is the *Site Organization.* This dimension refers to the organization of information on the website, its design and usability and the information's quality and it is close to the efficiency dimension of E-S-Qual (Parasuraman et al., 2005). Hanson and Ward (1999) asserted the numerous beneficial impacts of a high level of well-designed site for a company as the trust and confidence felt by the consumers and the reinforce of an image of competence and usefulness. Möhlmann (2015) also includes this dimension in the construct while Cheng et al. (2018) included a dimension called "structural assurance" that refers to how comfortable customers feel with the website. The items included in this dimensions describe the organization of the information and the ease of use, finding what the customer needs and concluding transactions of the app/website.

The second relevant dimension proposed, related to the interaction between customers and the platform, is *Platform responsiveness* assessing the attentiveness and promptness in dealing with customer's requests, questions, complaints and problems of the platform. Responsiveness is communicated to customers by length of time they should wait for answers to their questions or attention to problems. SERVQUAL also included this dimension and Cheng et al. (2018) inserted an item related to the willingness of the platform to response to the customer's inquires in his work; also Marimon et al. (2019) also included a dimension concerning the responsiveness of the platform. The items included in this dimension assess platform's features related to the promotiveness to answer to requests and questions and to care about users' problems and to offer fair compensations for its mistakes.

The third relevant dimension is labelled with *legal protection and trustworthiness and* it contains items concerning the ability of the platform to ensure the protection of customers' personal information and to guarantee a safe environmental in which transact and to the reliability of the information shared by the platform. In the CSM context, a platform with high legal protection would provide institutional guarantees to safeguard customers from loss of privacy, money, and security. In most of the CMS services, in fact, customers share sensible personal information as the credit card number, the ID code or the telephone number and the platform must commit itself to make customers feeling

safe about them. Cheng et al. (2018) also pointed the importance of this aspect in the context of ride-hailing and E-S-QUAL included "privacy/security" referred to the "degree to which the customer believes the site is safe from intrusion and personal information is protected" (Parasuraman et al., 2005). Also Marimon et al. et. al (2019) included this dimension in their scale. The items included in this quality factor evaluate the safeguards provided for the protection of users' personal information, the environmental in which transact and if it is safe and the legal structures to protect customers from problem with the company. The label used for this factor contains the term "trustworthiness" due the inclusion of an item (RH-LP4) which assess the trustworthiness of the opinions and ratings about drivers shared by the platform and its content is "The company provides reliable opinions and ratings about drivers". This items has been included in this dimension following the structure of CC-qual scale used as theoretical framework in this study. The authors, in fact, after the validation process of the scale, found a relationship between this factor and the item and proposed a final dimension aimed to assess " *the degree of concern felt by customers that something could go wrong with the service*" (Marimon et. al, 2019). The reliability of the ratings shared is a very important issue in RH context in which passengers could see the ratings of drivers given by other users and give ones by their own since they based on them their expectations. A high level of reliability of the information leads the customers to feel secure and safe about the service experience they will live. If the ratings and the opinions shared by the platform are not reliable, this leads to a no reliable service and a low level of customers' trust and this affects their loyalty and satisfaction. In the literature, many authors have stressed the relevance of this topic in CC and in the e-commerce (e.g. Ert et. al, 2016; Loiacono at al., 2002; McKnight et al., 2002). Cheng et al. (2018) also included a dimension "information congruity" which is close to that one considered and it refers to the match between the description online and that one offline showed by the platform; also reliability's dimension of SERVQUAL concerns the fulfilment of the agreement while the results of Barnes and Mattsson (2016)'s work was that the lack of awareness, trust and fear of strangers were CC inhibitors.

The fourth quality dimensions, linked to the interaction of the customer with the platform, concerns the service of assistance provided and the access to it and it is labeled *Contact*. This dimension assesses to the way with which the customer could access to customer

assistance service to receive information and support for problems. The platform provider should provide different channels to customers to access to the assistance service and allows them to receive support, by e-mail, voice call or other means, without long waiting time. If the access is difficult and characterized by long waits this affects negatively customers who could feel dissatisfied with the service experience. Parasuraman et al. (1985) also included this dimension in his first work describing it as "*the availability of assistance through telephone or online representatives*" (Parasuraman et al., 1985). This dimension includes items concerning the existence of different easy ways to access to assistance service and the adequacy of waiting time to access.

The last and fifth relevant dimension concerned to the interaction with the platform is *Economic* and it refers to the perceptions of the final consumer about the quality-price ratio and the general cost-effectiveness of the service. This dimension is not linked to a direct contact between customer and platform, but it has been included since it assess the price strategy provided by the platform provider in relationship with the quality perceived by the customer. In the previous literature, many authors stated the importance of this topic; for instance, Mont (2004) argued that the satisfaction of car sharing customers would be influenced by cost savings, including the initial cost of investing in a transportation option; Lamberton and Rose (2012) found that cost benefits of sharing is a key determinant of CC-service usage. Moeller and Wittkowski (2010) emphasized sharing options usually to be cheaper than non-sharing (traditional) options and consider price consciousness to be a principle determinant of using sharing options; also Benoit (2017) argued that the economic driver play an important role in deciding to use CC. while Hamari et al., 2015 suggested that economic benefits are especially important to both customers and peer service provider. The economic issues, in the specific CSM industry, is an important issue. In fact, CSM companies offers similar prices for the same service (e.g. Car2go vs Enjoy or Cabify vs Uber) and the switching costs are very low or, in some cases, inexistent; furthermore, competitors of CSM services are the traditional no-sharing services as public transport, taxis or the own car. Final customers, therefore, decide to use a service instead another one according to the price offered and the benefits they receive form the cost savings of using sharing options. The items of this dimension evaluate the customer perceptions about the price-quality ratio and the economic

convenience in comparison with the traditional mobility services referring to public transport, use of the own cars and taxis.

To summarize, the set of the relevant dimensions in service quality concerned with the interaction with the platform are:

- Site organization (RH-SOR): organization of information on the app/website used to access to the service by customers, its design and usability and the information's quality.
- Platform responsiveness (RH-PRA): attentiveness and promptness of the platform in dealing with customer's requests, questions, complaints and problems.
- Legal protection and trustworthiness (RH-LP): protection of customers' personal information and trustworthiness of the information shared
- Contact (RH-CON): ease and speed of access to customer assistance service provided by different channels.
- Economic (RH-ECO): quality-ratio perceptions and the cost-effectiveness of the service in comparison to traditional no-sharing mobility services.

2. RH Car perceived quality dimensions

RH customers directly interact with the vehicle and they expect to find a comfortable, clean and visually appealing cars. This aspects are very important ones about which the RH company should care. In fact, the use of comfortable, clean and good-looking cars is reflected in a high and good image of the company provider and this affects customers' satisfaction and loyalty. The aspect related to the physical appearance of the vehicle are assessed by the dimension *Tangibles*. The assessment of the physical assets is an important aspect for many CC company; for instance, in the Airbnb satisfaction scale, one of the seven items used refers to the cleaning of the rooms, in a similar way, the RH companies should assess the quality of the vehicles used. Items related to the comfort, visual appealing and the level of cleanliness of the vehicle are included in this dimension. Although neither Cheng (2018) nor Marimon (2019) included this quality dimension in their scales, it was assessed in SERVQUAL (Parasuraman et al., 1988) in which the authors included a dimensions assessing both physical facilities and also the equipment and the personnel.

In summary, the dimensions proposed for the assessment of the interaction of the customer with the car is only one, Tangibles (RH-TAN) which refers to the visual appealing, comfort and state of cleanness of the shared cars.

3. RH PSP perceived quality dimensions

As stated before, an important interaction involving the final customer using ride-hailing service is that one established with the peer service provider (PSP) identified in the person who deliver the service. In RH context, the PSP coincides with the driver who "deliver" a ride to the final customers using his/her own car. PSPs' tasks are to serve in the best way the final customers, to show professionalism and take care about passengers' needs. Customers expect to meet a drivers who show both professional competences, as driving in a safe way and be capable to do their job, and empathetic attitudes referring to their benevolence to help them when they need. Cheng (2018) in his work, for instance, though interviews to customers, stressed the importance of the empathy of drivers reporting some passengers' complaints referring to situations in which the driver never stops talking or to the air conditioning too high in the car. To assess the interaction with PSPs/drivers, two quality dimensions have been included: *PSP competences (PSP)* and *Empathy (EMP)*. Items included in the first dimension assesses the competences and professionalism of the PSPs and the capability to provide the promised service and to do a capable job (Cheng et al., 2018). The dimension "empathy", instead, refers to the PSP's benevolence and willingness to help customers and it could be described as "*an offline entities personality and benevolence to the customers"* (Cheng et al., 2018). Employees' professionalism and their willingness to serve customers were also included in SERVQUAL (Parasuraman, 1985) and in the works of Marimon et al. (2019).

To summarize, the dimensions aimed to assess the interaction of the final customer with the peer service provider included in RH-scale are:

- PSP competence (RH-PSP): competences and professionalism and the capability to provide the promised service of the PSPs.
- PSP empathy (RH-EMP): benevolence and willingness of the PSPs to help customers.

The final version of the RH-scale proposed is given in the table 3.2,and it is therefore, composed by 27 items and 5 dimensions, 5 concerning the interaction with the platform, 1 assessing the physical appearance of the shared assets and 2 linked to the interaction

with the person who deliver the service, the peer service provider and two new specific quality dimensions related to the interaction with PSP. Appendix 1 shows the source from the past literature for each item included in the RH-scale proposed from the past literature is given.

	Dimensions	Code	Items
Platform perceived quality	Site Organization	RH-SOR1	The information of app/website is well organized.
		RH-SOR2	The app/website is easy to use.
		RH-SOR3	The app/website makes it easy to find what I need.
		RH-SOR4	The app/website makes it easy for me to conclude my transaction.
	Platform Responsiveness	RH-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.
		RH-PRA2	The company takes care of problems promptly
		RH-PRA3	The company offers fair compensation for its mistakes.
	Legal protection and trustworthiness	RH-LPT1	The company provides enough safeguards to make me feel comfortable about personal information.
		RH-LPT2	The company makes it safe for me to conduct online transactions there.
		RH-LPT3	The legal structures adequately protect me from problems with the company.
		RH-LPT4	The company provides reliable opinions and ratings about drivers or passengers.
	Contact	RH-CON1	I can access to the customer assistance by different channels (online, by email, by a voice call)
		RH-CON2	The app/website provides contacts to easily reach the customer assistance (number, e-mail or others)
		RH-CON3	The waiting time for Receiving assistance is adequate
	Economic	RH-ECO1	For the given price, I rate the service offer as good.
		RH-ECO2	For the given quality of the service offer, I rate the price as good.
		RH-ECO3	The company offers more affordable prices than traditional transportation services
Car perceived quality	Tangibles	RH-TAN1	The car is comfortable.
		RH-TAN2	The car is visually appealing.
		RH-TAN3	The car is clean.

PSP perceived quality	Peer Service Provider Competence	RH-PSP1	The driver is competent at serving customers.
		RH-PSP2	I can rely on the driver to finish his/her part of riding.
		RH-PSP3	The drivers is good at what he/she does.
		RH-PSP4	I can rely on the driver to arrive at my destination.
	Peer Sevice Provider Empathy	RH-EMP1	The driver acts in a customers' best interest.
		RH-EMP2	If a customer requires help, most driver does the best to help
		RH-EMP3	The driver is interested in customer well-being, not just his/her own well-being.

Table 3.2.: RH-scale proposal

3.2.2 RS-scale proposal

For the development of the RS-scale, the areas analyzed for the definition of the construct's domain of ride-sharing scale are related to the four interactions the RS customers established using the service: with the platform, with the car, with PSPs and with the other users.

1. RS Platform perceived quality dimensions

RS users' access to the service using a digital platform as a website or an online application provided by the company. The relevant quality dimensions and items proposed to assess this interaction are the same ones included in the RH-scale: *Site organization (RS-SOR)*, *Platform responsiveness (RS-PRA)*, *Contact (RS-CON)* and *Economic (RS-ECO).* In fact, also in the context of ride-sharing, the features related to the organization of the information in the app interface, the willingness of the platform to take care about customers' problems, legal protection and access to assistance support and the cost-effectiveness aspects remains still important factors which affects the perceptions of the service quality of customers.

Also in this case an item assessing the trustworthiness of the opinions and ratings of drivers and passengers (RS-LP4) has been included assessing the trustworthiness of the opinions and ratings of drivers and passengers shared by the platform and its content is "The company provides reliable opinions and ratings about drivers and passengers". The label of the dimensions proposed is, as for the case of ride-hailing, *Legal Protection and trustworthiness* because it encloses this item. Note that there is a slight difference from the previous case of ride-hailing because in this case the item refers to opinions and

ratings of both drivers and passengers. In fact, in the case of ride-sharing, the user could rate both the driver and the other passengers with whom he/she shares the ride. The reliability of these information is very critical in this case because all the expectations the customer built about his/her future experience are based on this information. RS customers share a ride with strangers and a high level of trustworthiness of these information is extremely important to instill trust and drive customers to use this type of service. The unique information the customer have to build their expectations are, in fact, the comments shared by the other used and if they don't trust in their reliability, they won't decide to use the service and this affects their loyalty and so, the perceived quality.

2. RS Car perceived quality dimensions

As concern the interaction between customers and the shared cars, all the aspects related to the physical appearance of the vehicles resulted important also in the ride-sharing case. Also in this case, the customer expects to share a ride in a comfort, visually appealing and clean car and all this aspects influence the perceptions about the level of quality of the service. Also in this case, the dimension *Tangibles* (RS-TAN) assessing all these features has been included with all same the items proposed for the previous case of ride-hailing,

3. RS PSP perceived quality dimensions

The contact between the customer and the peer service provider results, also in the case of ride-sharing, relevant and important and all the quality features related to this should be assessed in the scale. In fact, also in this case, final customers directly interact with drivers (PSPs) and they expect to be served by professional drivers who know how to do their work and do the best to help them. All the PSPs' characteristics, both professional and personal, directly affect the perceptions of quality of the service and items aimed to assess these features are to be included. For this reason, the dimensions *PSP competence* (RS-PSP) and *PSP empathy* (RS-EMP), proposed for the RH-scale (see table 3.3: RH-scale proposal), have been are included in RS-scale with the same items and the same considerations.

4. RS Social interaction perceived quality dimensions

By joining a ride with other passengers, the final customer interacts directly also with other users, both drivers and riders. As stress before, this type of interaction is specifically relevant and critical in this type of service. The interaction with other users deals the

social interactions the customer could live using the service sharing a ride with new people. A customer who decides to share a ride with strangers expects to meet new people with whom spent pleasant time, chat during the journey and develop social relationships; the expectations a RS user has are the same he/she would have for a travel with friends and, therefore, to spend a good travel time and to find a friendly environmental. The social interaction issue is one of the main features of this type of service: customers who decide to use ride-sharing are looking not only for a transportation service but for a social experience. The quality dimension related to the interaction of the passenger with the other users is called *Social interaction* (SI). This dimension includes, items assessing the enjoyment and the living of positive experiences sharing a ride with other people and about the customer's feeling safe doing it. In fact, share a ride with strangers could be good or, sometime, not and to feel safe with strangers is one of the main needs of RS customers. The RS platforms, however, allows the customer to see, before the journey starts, all the information about the driver and the other passengers, their name, age and also the comments and ratings of them given by others; to feel safe joining a ride depends on the trust the customers have in these information and the general reliability of the platform. In this context, therefore, reliability of information, trust and reputation play important roles. It is important to note that, the reliability of the information published by the platform is assessed in the LPT dimension while all the issues related to the social aspects are evaluated in the SI dimension. In the previous literature, many authors stressed the important of this social interaction aspect; for instance, Möhlmann (2015) pointed that community belonging was an antecedent of satisfaction in collaborative consumption while Guttentag (2015) emphasized the importance of direct interaction with the local community for consumers. Barnes and Mattsson (2016) found that the social factor is a driver for future CC's growth.

In summary, the structure proposed for the RS-scale is composed by dimensions assessing the interaction with the platform and the vehicle and it contains also the quality dimensions related to the quality perceived of the peer service provider and the social interaction with the other peers. The result is a survey of 31 items and 9 quality dimensions: The final structure of the RS survey is given in the table in the next page (table 3.3) while appendix 2 reports the same structure and, for each item included, the source from the past literature.

	Dimensions	Code	Items
Platform perceived quality	Site Organization	RS-SOR1	The information of app/website is well organized.
		RS-SOR2	The app/website is easy to use.
		RS-SOR3	The app/website makes it easy to find what I need.
		RS-SOR4	The app/website makes it easy for me to conclude my transaction.
	Platform Responsiveness	RS-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.
		RS-PRA2	The company takes care of problems promptly
		RS-PRA3	The company offers fair compensation for its mistakes.
	Legal protection and trustworthiness	RS-LPT1	The company provides enough safeguards to make me feel comfortable about personal information.
		RS-LPT2	The company makes it safe for me to conduct online transactions there.
		RS-LPT3	The legal structures adequately protect me from problems with the company.
		RS-LPT4	The company provides reliable opinions and ratings about drivers or passengers.
	Contact	RS-CON1	I can access to the customer assistance by different channels (online, by email, by a voice call)
		RS-CON2	The app/website provides contacts to easily reach the customer assistance (number, e-mail or others)
		RS-CON3	The waiting time for receiving assistance is adequate
	Economic	RS-ECO1	For the given price, I rate the service offer as good.
		RS-ECO2	For the given quality of the service offer, I rate the price as good.
		RS-ECO3	The company offers more affordable prices than traditional transportation services
Car perceived quality	Tangibles	RS-TAN1	The car is comfortable.
		RS-TAN2	The car is visually appealing.
		RS-TAN3	The car is clean.
PSP perceived quality	PSP Competence	RS-PSP1	The driver is competent at serving their customers.
		RS-PSP2	I can rely on driver to finish the part of riding.
		RS-PSP3	The driver is good at what he/she does.
		RS-PSP4	I can rely on the driver to arrive at my destination.
	PSP Empathy	RS-EMP1	The drive acts in a customers' best interest.
		RS-EMP2	If a customer requires help, the driver does the best to help
		RS-EMP3	The driver is interested in customer well-being, not just his/her own well-being.
Quality of social interaction	Social Interaction	RS-SI1	The use of the service allows me to develop social relationships.
		RS-SI2	I enjoy myself sharing a ride with new people.

	RS-SI3	I usually find a friendly environmental when I shared a ride.
	RS-SI4	I feel safe sharing a ride with other people I don't know using the service.

Table 3.3.: RS-scale proposal

3.2.3 CS-scale proposal

To define the construct's domain of car-sharing scale, the interaction established by the final customer have been analyzed: with the platform and with the car. For each interaction, a set of relevant dimensions and item have been proposed.

1. CS Platform perceived quality dimensions

As concern the quality dimensions related to interaction between the customer and the platform, they are the same ones proposed for the other two surveys: *Site Organization, Platform responsiveness (CS-PRA)*, *Legal Protection (CS-LP)*, Contact *(CS-CON) Economic (CS-ECO)*. In fact, all these aspects like the organization of information on the app/website and its ease of use, the responsiveness to customers' problems and complaints, the legal protection provided, the easy access to the customer assistance service and the price-quality ratio perceptions are, in the same way, important also in car-sharing context. As concern *Site Organization* dimension, all the items previously proposed for this dimension have been included without alterations while other two new items have been added:

i. A new item (CS-SOR4), concerning the way the application allows users to easily get to the position of the booked car, has been included in *Site organization* dimension and its content is "The app/website allows me to easily reach the precise location of a car I would like to rent". In fact, if the location system is not accurate, the risk is that customers could waste time in reaching the vehicles they would rent, and it makes difficult to start the rent when customers need, and this negatively affects their perceptions. In fact, a customer experts to use a mobility service in which he/she can easy reach the precise position of a car and to receive instruction of how do it and about the vehicle, as license plate or a identification number, in order to facilitate the

search and the start of the rent. The aspects concerning the accuracy of the location system is assessed by this new item which describes the ease of find cars by using the CS app including the accuracy of GSP system as well as of the information on the map provided by the app and all the materials shared on the platform about cars (license plate or car's identification number etc.) that can support customers in reaching of the car in a easy way . The items has been included in SI dimension since it regards a function of the app and it is linked to the usability of the platform.

ii. A new item (CS-SOR5) concerning the ease to reports by the app the cars' damages has been included in *Site organization* dimension and its content is "The app/website allows to easily report the car-damages". In fact, before the start and after the end of a rent, a user could report, by the app, physical damages on the car, if any are present. This mechanism of damages report aims to manage the responsibilities of damaging the physical assets and to find the users that are guilty. In fact, if a user, before he/her rents a car, find damages on the car and reports them by the app, he/her won't be considered to be guilty; by a cross-checking the data of vehicle, the users' rent and damages reports, in fact, the company is able to find the responsible of these damages. If a user who has made a damage on the car doesn't report it after the end of the rent, the next user will find and report it in order to not be accused to be guilty. This is a very important mechanism which help the company to assign the legal blames to the right person and the customer to not take blames of some other. If the report of damages by the app results difficult to do or it results not accurately design, this leads to problems both to the company, in the managing of the legal accountabilities, and to customers who can't easily do it or not in the best way and, for this reason, they could be unjustly accused. The easy of doing damages report by the app is assessed by this new item.

As concern *Legal protection* (CS-LP) dimension, labelled for the other two surveys with *Legal protection and trustworthiness,* the item aimed to assess the honesty of the ratings about passengers/drivers is not included here cause the driver is identified in the final user and no ratings or comments could be shared by the platform. For this reason, the label of this dimension is in this case only Legal protection which assesses only the aspect related

to the protection provided by the company to customers about personal information and problems with the platform. A new item (CS-LPT4) concerning the clearness of the insurance coverage's terms has been included in Car-sharing Legal protection dimension and its content is "The terms of the insurance coverage provided are clear and easy to understand. In fact, close to the issues of legal blames, the aspect concerning the insurance coverage provided by the company to any users of the service is important in car-sharing. In fact, car-sharing allows customers to drive directly a car while in the other two service, CH and RS, the customer is a passenger. The CS user can drive a car without cares about the insurance coverage which is provided by the CS company. The company should allow users to know precisely all the terms of the insurance in order to lead them to have clearly in their mind all the legal consequences and the penalties before using the service. The assessment of the clearness of the terms of the insurance coverage provided and, so, the transparency of these information shared by the platform, is possible by the inclusion of this new item. The other items included in this dimension are the same ones included in the other scales.

As concern the other dimensions assessing the interaction with the platform, *Platform Responsiveness*, *Contact* and *Economic*, proposed for the other two scales, they have been included in CS-scale with same items.

2. CS Car perceived quality dimensions

As concern the interaction of the customer with the vehicles, unlike in RH and RS where the customer is a passenger, the user drive the car directly. Therefore, the aspects as comfort, cleanness, and the general appearance became very important for the user/driver. A customer, in fact, expects to find a comfortable vehicle to drive and the features concerning its cleanliness and the visual appeal affect his/her perceptions about the quality. In order to assess the perceptions about the physical shared-asset, the dimension *Tangibles* and all the items previously proposed for the other two scales have been included without changes. In addition, a new item has been included evaluating if the technological equipment installed on the car, used by customers to start and end the rent, is easy to use; if it is not, customers, in fact, are not able to start and finish the rent in an easy way and this leads to waste time and to negatively perceive the quality of the service.

The content of this new item is “The technological equipment installed on the car allows to start and to end the rental easily”.

In summary, the CS-scale proposed, given in the table 3.4 (next page), is composed by 22 items and 6 quality dimensions assessing the interactions of the customer with the platform and the vehicle. Appendix 3 reports the source from the past literature of each items included in the CS survey proposed.

	Dimensions	Code	Items
Platform perceived quality	Site Organization	CS-SOR1	The information of app/website is well organized.
		CS-SOR2	The app/website is easy to use.
		CS-SOR3	The app/website makes it easy to find what I need.
		CS-SOR4	The app/website makes it easy for me to conclude my transaction.
		CS-SOR5	The app/website allows me to easily reach the precise location of a car I would like to rent.
		CS-SOR6	The app/website allows to easily report the car-damages.
	Platform Responsiveness	CS-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.
		CS-PRA2	The company takes care of problems promptly
		CS-PRA3	The company offers fair compensation for its mistakes.
	Legal protection	CS-LP1	The company provides enough safeguards to make me feel comfortable about personal information.
		CS-LP2	The company makes it safe for me to conduct online transactions there.
		CS-LP3	The legal structures adequately protect me from problems with the company.
		CS-LP4	The terms of the insurance coverage provided are clear and easy to understand.
	Contact	CS-CON1	I can access to the customer assistance by different channels (online, by email, by a voice call)
		CS-CON2	The app/website provides contacts to easily reach the customer assistance (number, e-mail or others)
		CS-CON3	The waiting time for receiving assistance is adequate
	Economic	CS-ECO1	For the given price, I rate the service offer as good.
		CS-ECO2	For the given quality of the service offer, I rate the price as good.
		CS-ECO3	The company offers more affordable prices than traditional transportation services

Car perceived quality	Tangibles	CS-TAN1	The car is comfortable.
		CS-TAN2	The car is visually appealing.
		CS-TAN3	The car is clean.
		CS-TAN4	The technological equipment installed on the car allows to start and to end the rental easily.

Table 3.4: CS-scale proposal

Chapter 4
Data analysis

4.1 Introduction to data analysis

The RH-scale, RS-scale and CS-scale surveys proposed in the last sections (see section 4.2: RH-scale, RS-scale and CS-scale proposals) were sent to three different samples of 63, 71 and 67 people respectively from Italy and Spain and the collection of the data lasted 2 weeks. The target population consisted of customers who were possible users of these kind of service or they probably were familiar with them as students or generally young people. Each survey consisted of two parts: one related to socio-demographic questions and service frequency usage and the other one containing the set of scale's items proposed. The first part of the surveys included questions about age, gender and profession and a question related to the usual usage of the that type of service (never, occasionally, often or sometimes). Another question was included asking if the service was used in the last years in order to consider as the final sample only those customers that have answered positively in order to obtain data as closer as possible to the real experience.

Table 4.1 shows the characteristics of the three samples collected for the analyses, about respondents' s socio-demographic data and the frequency of usage of the three services.

	Ride-hailing	Ride-sharing	Car-sharing
Sample			
Size	63	71	67
Gender (%)			
Female	41.27	47.89	55.22
Male	58.73	52.11	44.78
Age (%)			
18-25 years	41.27	39.44	38.81
26-35 years	50.79	38.03	47.76
>35 years	7.94	22.54	7.46
Profession (%)			
Student	42.21	42.25	46.27
Employed	49.21	56.34	53.73
Unemployed	7.94	1.41	0

Frequency of use (%)			
Never	30.16	29.58	8.96
Occasionally	49.21	47.89	29.85
Sometimes	14.29	14.08	32.84
Often	6.35	8.45	28.36

Table 4.1: Demographic characteristics and frequency of use data of RH, RS and CS samples

As it is possible to note, there isn't a significant predominance of users' gender while the most common category is that one of 26-35 years old in the RH and CS, 18-35 for RS as concerned the age. The workers users are predominant in all the cases analyzed. About the usage frequency of the service, the RH and RS respondents use the service occasionally while the CS ones use the service more frequently. The different frequency usage could be due to the different propose of each typology. In fact, car sharing offers a service which aims to substitute the use of traditional mobility services (e.g. personal car, public transport etc.) and it generally allow the customer to move from a point of the city to another. A CS user would use the service to go to work, to go to the supermarket or generally for daily movements. Ride-sharing services propose is quite different and RH users generally use it to move from a city to another or generally for longer journeys. For this reason, the RS frequency of use could be minor than the CS one. Even if the ride-hailing propose is similar to that one of car-sharing, moving from point A to B in the same city, it is important to stressed that the data were collected from both Italy and Spain and ,unlike to the other services, RH is common in Spain but not in Italy and this could be the reason of the low frequency.

4.2 Validation of the scales

After the collection of the surveys data, the next step was to validate the scales proposed. For the validation process different statistic instruments have been used:

1. exploratory factor analysis (EFA) to establish the definitive dimensions
2. reliability analysis (RA) to investigate the intern factor reliability
3. construct validity analysis (convergent and discriminant validity analysis) to test if the survey represents the concept that it's intended to measure
4. confirmatory factor analysis (CFA) to confirm the definitive configuration of the scales

1. Exploratory Factor Analysis

For each measurement instruments proposed, an exploratory factor analysis was executed to evaluate the items' common factors. The EFA allows to reduce a wide range of initial observed variables (or Items) by obtaining a simplified model that synthesizes the data without a loss of information. The result of this analysis is a set of extracted factors (or quality dimensions) contain items highly correlated to a specific factor and poorly to the others. These factors are labeled with "latent" because they are not directly measurable, but they are expression of other specific variables that are observable and measurable. Every factor extracted is successively interpreted by considering the meaning of the items included in it.

Before performing the EFA for each scale, it is necessary to first test if the dataset is well suited for factoring. The statistic instrument used for this type of analysis were the Kaiser-Meyer-Olkin indicator (KMO) and Bartlett's sphericity test. In particular:

- The Kaiser-Meyer-Olkin (KMO) is an indicator of sampling adequacy and it indicates the proportion of variance among variables that might be caused by latent factors. KMO statistic varies between 0 and 1 and, as a rule of thumb, the KMO indicator is considered good if it loads equal or greater than 0.6.
- Bartlett's sphericity test tests the hypothesis that the correlation matrix between the variables is equal to an identity matrix. If the variables are unrelated and whereas the result of this test is positive, it would be impossible to extract common factors and the data set would be unsuitable for factoring. The dataset is adequate for factoring if the p-value is quite null and the hypothesis of the test is refused.

After testing the starting data set's adequacy, the next step was to perform the factor analysis. The EFA was conducted by using the statistic software SPSS. The Principal Component Analysis (PCA) was used with Varimax rotation and the factors were extracted using Kaiser criteria (factor with eigenvalues value greater than 1). For each EFA, it was analyzed the components' rotated matrix which contains estimates of the correlations between items and the extracted components. This matrix was analyzed by using a strict acceptable threshold of 0.6 in order to obtain robust results. The extracted factors were interpreted and a definitive questionnaire scheme (dimensions/items) was proposed for each of the three cases.

2. Reliability Analysis of each factor

The reliability analysis (RA) aims to verify the one-dimensionality of the scale and to test whether inter-factor items reliably measure the same construct. In this analysis, a factor analysis was performed for each factor extracted considering only the items suggested in the previous step (step a). Internal reliability was assessed by valuating the Cronbach's alpha (αc) and Composite Reliability (CR). The two statistic tools can both be used for RA and they both indicate a good inter-factor reliability the more the value is closer to the unit. The criteria used in this step were these of Nunnally & Bernstein, 1994: $\alpha c > 0.7$ e $CR > 0.7$.

3. Validity Analysis

The third step of the validation process was to test the convergent validity (CV) and discriminant validity (DV), subcategories of the so called "construct validity". The term refers to the degree with which a scale measures the theoretical construct that it is intended to measure. The CV analysis assess how much items of the same factor are related to each other. In fact, two or more items included in the same dimension should have a high correlation because they are designed to evaluate the same factor. To test the CV level, the value of the average variance explained of each factor (AVE) was examined and the criteria used was AVE> 0.5 (Fornell & Larker, 1981). DV analysis measures the distinction degree between measures of different constructs and it tests that the correlation between factors are not too high. In fact, different dimensions of the same questionnaire evaluate different aspects of the main construct and for this reason they shouldn't be related. The DV analysis was conducted using linear correlations between the latent factors extracted and it was examined whether the correlations within the same factor were less than the value of the square root of the EVA. In this phase a matrix was proposed in order to allow an easy lecture of the results contains the square of AVE in the main diagonal and the values of the linear correlations between factors in the other cells.

4. Confirmatory factor analysis

The fourth and last step of the scale validation process consists in the confirmatory factor analysis (CFA). The confirmatory analysis is different from the explorative one (step a) because the starting survey pattern is that one established by the EFA in the previous step and the number of the dimensions, the links between them and the items included are

known. The aim of this analysis is to confirm the model obtained by assessing the degree to which this model fits the data and to which it describes the real observations. In this phase the EQS software was used to perform the CFA by using the same samples of the previous steps. The model was estimated from the asymptotic variance-covariance matrix by the robust maximum likelihood method. One of the fitting measures considered, given as outputs by the software, was the Satorra-Bentler χ^2 which test the hypothesis of the absence of differences between the data and the model. In this case the criteria used were the p-value of the statistic χ^2 greater than 0.05 the ratio χ^2/dof less than 5. The Comparative Fit Index (CFI) and the Root Mean Squared Error of Approximation (RMSEA) were also analyzed in this phase. A good level of adaptation of the data to the model is represented by a value of CFI greater than 0.9 and a RMSEA value less than 0.08.

It is important to stressed that the CFA analysis indicators are influenced by the size of the samples used and the results tend to be significant if the samples' unit number is greater than almost five times the number of items included. The samples collected in this thesis are not enough large for this type of analysis and the results could be influenced and distorted. It was decided, despite this, to execute the analysis in order to observe the results in this first explorative phase in the hope that it would be useful for future studies.

The following sections (4.1.1, 4.1.2, 4.1.3) provide specific details about the validation processes of RH, RS and CS scales respectively.

4.2.1. RH-scale validation process

RH scale's data analysis reports positive values for both dataset adequacy statistics and, precisely, KMO loads 0.735 (more than the acceptable threshold of 0,6) and the p-value of Bartlett's sphericity test is null. As concern the factors extracted by the EFA, they are 8 with a total percentage of the explained variance of 76%. Only the first four of the total factors extracted have been considered in the final factor solution. In fact, each of the last three factors explains only a percentage less than 6% of the variance and they contain only less than 2 items. For this reason, they have been considered irrelevant for this type of analysis and, for the final solution, the first four factor have been included with a total amount of variance explained of 58.26 %.

The details of the analysis are given in the table 4.2 which shows the item's loads for each factor extracted and, highlighted in red, the values greater than 0.6 (acceptable threshold fixed). In the last row of the matrix, it is reported the percentage of variance explained by each factor.

	RH-RID	RH-SOR	RH-EMP	RH-ECO				
RH-TAN1	0.881	0,134	0,115	0,036	-0,028	0,115	-0,095	-0,129
RH-TAN2	0.798	0,150	0,070	0,074	0,152	0,053	-0,064	-0,318
RH-TAN3	0.777	0,243	0,254	0,204	0,157	-0,038	0,127	0,075
RH-PSP2	0.773	0,248	0,227	0,075	-0,261	0,048	0,163	0,072
RH-PSP4	0.667	0,071	0,215	0,166	-0,051	0,097	0,342	0,415
RH-PSP3	0.608	0,283	0,420	0,355	-0,168	-0,165	0,239	0,160
RH-PSP1	0.588	0,350	0,317	0,269	-0,028	-0,163	0,320	0,020
RH-ECO1	0.514	0,392	0,219	0,374	-0,098	-0,114	0,047	-0,204
RH-SOR3	0.083	0.861	0,002	0,167	0,123	0,136	0,126	0,126
RH-SOR2	0.395	0.792	0,065	0,078	-0,035	0,155	0,048	0,198
RH-SOR1	0.312	0.724	0,093	0,112	0,155	0,109	0,294	0,065
RH-SOR4	0.066	0.660	0,418	0,288	-0,300	-0,004	0,042	0,217
RH-C1	0.178	0,571	0,160	-0,247	-0,048	-0,063	-0,089	-0,369
RH-EMP2	0.129	-0,027	0.833	0,129	0,071	0,196	-0,003	0,120
RH-EMP3	0.191	0,075	0.822	0,097	0,075	-0,205	0,130	0,038
RH-EMP1	0.267	0,201	0.700	0,127	-0,075	0,006	0,014	-0,041
RH-LPT2	0.097	0,125	0,558	-0,272	0,181	0,450	0,153	-0,273
RH-ECO3	0.094	0,211	0,158	0.799	-0,066	0,069	-0,015	-0,133
RH-ECO2	0.292	0,083	0,172	0.763	0,169	0,076	0,242	0,019
RH-PRA3	-0.473	0,120	0,063	-0,515	0,003	-0,123	0,101	-0,238
RH-C3	-0.111	-0,111	0,125	-0,037	0.805	-0,214	-0,202	0,020
RH-LPT1	0.055	0,242	-0,029	0,135	0.661	0,397	0,167	0,077
RH-LPT3	0.073	0,207	0,012	0,137	-0,013	0.841	0,104	0,012
RH-PRA1	0,090	0,405	-0,057	-0,064	0,363	-0,480	0,261	-0,245
RH-PRA2	0.001	0,283	0,171	0,088	0,015	0,113	0.734	0,050
RH-C2	0.503	-0,093	-0,055	0,003	-0,281	-0,022	0,587	-0,237
RH-LPT4	-0.060	0,212	0,069	-0,086	0,051	0,015	-0,043	0.825
% of variance	18.781	13.760	11.126	8.409	6.186	5.991	5.897	5.865

Table 4.2: RH-scale components' rotated matrix

The first factor extracted is composed by all the original items of Tangibles dimension (RH-TAN1, RH-TAN2, RH-TAN3) and three items form the PSP Competence one (RH-PSP2, RH-PSP3, RH-PSP4) and it explains 18.78% of the variance. The definitive label used for this factor is Ride because it assesses all the characteristics of the ride service provided, the driver and his professional competences, and the physical appearance of car

used. This result is justifiable due the propose of the ride-hailing service is to provide to the final customer a driver-plus-car service and these two aspects are, therefore, highly correlated and they are incorporated in the same quality perceived dimension.

The second factor extracted is Site Organization and it accounts for the 13.76% of the variance. It includes all the four original items of the dimension (RH-SOR1, RH-SOR2, RH-SOR3, RH-SOR4) and it evaluates all the quality aspects concerned to the organization of the info and the ease of use of the app/website used to access to the service including the ease to conclude the transactions.

The third factor extracted is PSP Empathy and it represented the 11.12% of the variance. It is composed by the items of the original dimension (RH-EMP1, RH-EMP2, RH-EMP3) and it captured the perceived quality of the personal characteristics of the driver. This factor, as in the original scale pattern, differs from the perceived quality dimension related to the PSP competence which items are included in the factor Ride. This result is consistent with that one obtained in the Cheng (2018) in which the dimensions PSP competence and PSP empathy are separated, and the items included in the Empathy dimension are the same obtained by the EFA in this study.

The fourth factor explains 8.41% of the variance and its label is that one of the original dimension: Economic. It retains two of the three original items (RH-ECO2, RH-ECO3) which assess the general perceived quality of the economic aspects and, precisely, the quality-price ratio and the affordability of the service compared to the other traditional mobility services. The first item, RH-ECO1, has been retained out by the analysis. Its meaning is quite similar to that one of RH-ECO2 because, instead to evaluate the price offered in relation to the price as RH-ECO2, it assesses the perceived quality of the service in relation to the price. Its elimination could be justified because the aspect which aims to capture is also captured by RH-ECO2.

The factor solution obtained by the EFA is finally composed by 4 quality dimensions from the 7 originals one with a total amount of 15. The final factors generally overlap with some of the original dimension except for the first factor in which there is the combination of two different dimensions justified by the scope of the RH service. Only

slight adjustments have been inserted like exclusions of some original items without migration of items between original dimensions. The quality dimensions removed by the analysis are Platform responsiveness that assess the response willingness of the platform provider, Legal protection and trustworthiness links to the legal and personal data protection and the veracity of the information published in the platform, and Contact concerned to the access to the customer assistance service. The result is only partially consistent with Cheng et al. (2018)'s work aimed to assess the quality of the RH company Uber; in fact, only the Empathy and PSP Competence dimensions of his work are been resulted by the analysis, but the other dimensions extracted are different. This result could be justified due the propose of this thesis work is to obtain three specific scales for the three services RH, RS and CS, by starting from a common measurement instrument suitable for a general shared-car mobility service. The process differs from that of Cheng et al (2018) and it could lead to different results.

The details about the analysis of the internal reliability of each factor and the convergent validity analysis are given in the tables 4.3 and 4.4. Each of the four EFA executed for each factor has extracted only one factor and the values of αc and RC founded are greater than the fixed thresholds (αc>0.7, RC>0.7). The convergent validity is confirmed for all four the factors: the average extracted variance value of each factor is greater than 0.5 and the value of Cronbach's alpha doesn't improve when any of the items are removed. The discriminant validity analysis has been positive too; in fact, the square roots of the AVE of each factor, reported in the main diagonal in in table 4.5, are greater than the off-diagonal values of inter-factor correlations.

RH-RID		RH-SOR		RH-EMP		RH-ECO	
RH-TAN1	0.857	RH-SOR1	0.910	RH-EMP1	0.850	RH-ECO2	0.897
RH-TAN2	0.772	RH-SOR2	0.891	RH-EMP2	0.885	RH-ECO3	0.896
RH-TAN3	0.877	RH-SOR3	0.869	RH-EMP3	0.819		
RH-PSP2	0.887	RH-SOR4	0.796				
RH-PSP3	0.841						
RH-PSP4	0.785						

Table 4.3: Loads of the four EFAs of each for each RH factors extracted.

	1	2	3	4
αc	0.911	0.887	0.809	0.746
Range of αc if one item is removed	0,885 - 0,910	0,792 - 0,833	0,681-0,788	\
Range of correlations between items and total corrected scale	0,671-0,824	0,661-0,926	0,608-0,716	\
RC	0.887	0.846	0.829	0.758
AVE	0.571	0.582	0.620	0.610

Table 4.4: Statistics of the four EFAs of each for each RH factors extracted.

	1	2	3	4
RH-RID	0,756			
RH-SOR	0,530	0,763		
RH-EMP	0,493	0,333	0,787	
RH-ECO	0,470	0,385	0,324	0,781

Table 4.5: Correlation matrix of RH latent factors

Next step is to perform the confirmatory factor analysis in order to evaluate if the dataset matches with the model proposed and to confirm the RH-scale model. The details about the CFA are given in the table 4.6 below. The Satorra-Bentler χ^2 loads 207 with 84 degrees of freedom and a null p-value and a χ^2/dof ratio with at 2.47. The CFI is 0.811 and RMSEA value loads 0.154 and both don't respect the recommended thresholds. The CFA leads to state that it is not possible to affirm that the data fit with the model proposed. As mentioned before, this type of analysis is sensible to the sample's size that in this case is of only 64 units not enough large for the CFA.

Dimensions	Items' code	Load	t-value	r^2
Ride				
	RH-PSP2	0.852	\	0.726
	RH-PSP3	0.855	9.82	0.732
	RH-PSP4	0.757	7.55	0.574
	RH-TAN1	0.776	9.75	0.602
	RH-TAN2	0.687	6.93	0.472
	RH-TAN3	0.859	10.54	0.738
Site Organization				
	RH-SOR1	0.829	\	0.688
	RH-SOR2	0.912	7.72	0.832
	RH-SOR3	0.815	10.7	0.664
	RH-SOR4	0.714	5.78	0.509

Empathy				
	RH-EMP1	0.726	\	0.526
	RH-EMP2	0.81	5.64	0.656
	RH-EMP3	0.775	5.2	0.600
Economic				
	RH-ECO2	0.925	\	0.856
	RH-ECO3	0.659	3.16	0.435

Goodness of fit summary	
Satorra-bentler scaled χ^2	207
dof	84
P-value	0,000
χ^2/dof	2.470
CFI	0.811
RMSEA	0.154
90% Confidence interval of RMSEA	(0.127-0.179)

Table 4.6: RH-scale confirmatory analysis

In summary, the validation process of the analysis has had positive results in all the steps, except for the CFA in which it is needed a larger sample. The final scheme proposed is composed by four of the original dimensions, two aimed to assess the interaction with the platform (Site organization, Economic) and two related to the perceptions of customers about the PSP and the physical asset (Ride, PSP empathy).

The RH-scale scale proposed is given in the table 4.7 including the definitive dimensions and items. Note that for each item included two codifications are reported: one given in the first step based on the literature review (column: “Original Code) and the other is the new one given as a result of the validation process (column: “New code”).

+	Original code	New code	Items
Site Organization	RH-SOR1	RH-SOR1	The information of the app/website is well organized.
	RH-SOR2	RH-SOR2	The app/website is easy to use.
	RH-SOR3	RH-SOR3	The app/website makes it easy to find what I need.
	RH-SOR4	RH-SOR4	The app/website makes it easy for me to conclude my transaction.

Economic	RH-ECO2	RH-ECO1	For the given quality of the service offer, I rate the price as good.
	RH-ECO3	RH-ECO2	The company offers more affordable prices than traditional transportation services
Ride	RH-PSP2	RH-RID1	I can rely on driver to finish their part of riding.
	RH-PSP3	RH-RID2	The driver is good at what he does.
	RH-PSP4	RH-RID3	I can rely on driver to arrive at my destination.
	RH-TAN1	RH-RID4	The car is comfortable.
	RH-TAN2	RH-RID5	The car is visually appealing.
	RH-TAN3	RH-RID6	The car is clean.
PSP Empathy	RH-EMP1	RH-EMP1	The driver acts in a customers' best interest.
	RH-EMP2	RH-EMP2	If a customer requires help, the driver does his best to help
	RH-EMP3	RH-EMP3	The driver is interested in customer well-being, not just his own well-being.

Table 4.7: RH-scale scale proposed for ride-hailing services

4.1.2 RS-scale validation

The first step for the validation process of RS-scale, as stated previously, is to test the dataset adequacy analysis for factoring. The KMO values loads 0.698 in respect of the threshold fixed of 0.6 and the p-value of the Bartlett sphericity test is null, and it could be stated that the data collected are good to perform the EFA.

The latent factors extracted by the EFA are 9 with a quote of explained variance of 75.88%. Only the first 5 factors have been considered relevant for the analysis because, as in the previous RH case, each of the last 4 ones explains less than 6% of the variance. The total variance explained by the factors considered is 53.93%.

The details of the EFA are given in the table 4.8 which contains all the latent factors extracted and the loads of the items for each factor. The loads greater than the threshold of 0.6 are highlighted in red and the quote of the variance explained by each factor are given in the last row.

	RS-RID	RS-SOR	RS-EMP	RS-SI	RS-ECO				
RS-TAN1	0,924	-0,026	-0,013	0,101	0,036	0,034	0,043	-0,035	0,178
RS-TAN2	0,835	-0,028	0,037	-0,059	0,126	0,103	0,035	-0,026	0,055
RS-TAN3	0,810	0,156	0,317	0,242	-0,015	0,009	0,042	0,029	-0,110
RS-PSP2	0,755	0,165	0,207	0,059	0,236	-0,208	0,164	0,094	-0,049
RS-PSP1	0,692	0,294	0,276	0,199	0,170	-0,120	0,206	0,114	-0,141
RS-PSP3	0,647	0,271	0,403	0,087	0,146	-0,311	0,095	0,188	-0,276
RS-SOR1	0,097	0,886	-0,033	-0,072	0,120	0,067	-0,056	-0,047	0,089
RS-SOR2	0,291	0,844	-0,091	-0,083	0,053	0,056	0,242	0,099	0,033
RS-SOR3	-0,046	0,833	-0,110	-0,127	0,156	0,219	-0,034	0,053	0,265
RS-SOR4	0,086	0,690	0,310	-0,173	0,150	-0,072	0,161	0,372	-0,043
RS-PRA2	0,029	0,581	0,184	0,230	-0,164	-0,213	0,164	-0,073	0,019
RS-EMP2	0,161	-0,010	0,823	-0,014	-0,009	0,172	-0,250	-0,062	-0,076
RS-EMP1	0,320	0,032	0,708	-0,111	0,121	0,094	-0,023	-0,234	0,050
RS-EMP3	0,354	-0,100	0,703	-0,058	-0,035	0,214	-0,082	0,210	-0,254
RS-LPT2	-0,246	0,143	0,594	-0,109	0,022	-0,009	0,428	0,027	0,362
RS-PSP4	0,313	0,152	0,540	0,152	0,093	-0,272	0,190	0,380	0,159
RS-SI2	0,152	-0,099	0,051	0,794	0,158	-0,007	-0,075	0,015	0,156
RS-SI3	0,063	-0,058	-0,148	0,749	-0,002	0,149	-0,012	0,296	-0,164
RS-SI4	0,073	-0,036	-0,290	0,716	0,094	-0,088	-0,092	-0,171	0,001
RS-SI1	0,072	0,027	0,246	0,703	0,166	0,108	0,220	0,016	0,177
RS-ECO2	0,084	0,038	0,087	0,088	0,844	0,117	0,071	-0,021	0,134
RS-ECO3	0,092	0,143	0,116	0,150	0,759	-0,152	-0,033	0,204	-0,082
RS- ECO1	0,323	0,093	-0,148	0,162	0,736	0,038	0,216	-0,192	-0,009
RS-C3	-0,121	-0,030	0,102	0,020	-0,002	0,823	0,000	0,129	-0,013
RS-PRA1	0,111	0,432	0,269	0,208	0,059	0,629	-0,039	-0,071	0,031
RS-C1	0,305	0,159	-0,221	-0,100	0,156	0,063	0,751	0,102	-0,024
RS-C2	0,437	0,155	0,027	0,208	0,152	-0,276	0,622	-0,040	-0,004
RS-LPT4	-0,033	0,128	-0,036	0,033	-0,073	0,248	0,112	0,778	0,195
RS-PRA3	-0,308	0,044	0,039	-0,118	-0,278	0,242	0,377	-0,534	-0,070
RS-LPT3	0,019	0,165	-0,116	0,077	0,058	-0,070	0,046	0,160	0,836
RS-LPT1	0,005	0,262	0,300	0,258	-0,024	0,367	-0,216	0,116	0,531
% of variance	15,341	11,833	10,650	8,791	7,315	5,905	5,674	5,245	5,127

Table 4.8: RS-scale Components' rotated matrix

The fist factor extracted is composed by all the items of the original dimension Tangibles (RS-TAN1, RS-TAN2, RS-TAN3) and only 3 of the 4 items from the PSP Competence (RS-PSP1, RS-PSP2, RS-PSP3) with a total amount od explained variance of 15.34%. This result is consistent with that found in the RH-scale validation process and, for the same reasons, the label chosen is *Ride* (RS-RID) also in this case. In fact, it assesses the

characteristics linked to the perceived quality of the final customer about the ride service provided, containing items concerned to the professional competences of the driver (or PSP) and to the assessment of the car driven. Like in the case of ride-hailing, the RS service provided is a driver-plus-car one and the aspect of this two factor are therefore related.

The second factor is *Site organization* (RS-SOR) and it accounts for the 11.83% of the variance. This factor evaluates the quality aspects of the app or website used by the final customer to access to the RS service like the ease of use, the organization of the information and the ease to conclude transaction. The latent factor overlaps with the original dimension because it includes all its items (RS-SOR1, RS-SOR2, RS-SOR3, RS-SOR4).

PSP Empathy (RS-EMP) is the third factor extracted and it explains 10.65% of the variance. The items contained are all the ones of the original dimension (RS-EMP1, RS-EMP2, RS-EMP3) and quality aspect evaluated is related to the empathy of the driver (PSP). This finding is the same founded in the case of RH-scale and, like in the previous case, the PSP empathic characteristics and the professional ones are assessed by two different factors.

The fourth latent factor has a quote of explained variance of 8.79% of the variance and it is labelled with Social interaction. The factor evaluates the aspects related to the social interactions experienced by the customer using the ride-sharing service, both with the driver (PSP) and the other customers. The items related to this factor are three of the four original ones and they evaluate the development of social relationships (RS-SI1), the enjoyment of sharing a ride (RS-SI2) and to feeling safe in sharing it with unknown people (RS-SI4).

The fifth factor resulting from the factoring is *Economic* (RS-ECO) and the percentage of variance explained by it is 7.31%. All three original items are included in it and they assess the perceptions of the price- quality and quality-price ratio (RS-ECO1, RS-ECO2) and the economic efficiency of the RS transport service compared to the traditional transport services (RS-ECO3). This result is the same one found in the RH-scale analysis in which the same factor has been extracted with the same items.

The inter-factor reliability is the next step of the validation process and the statistics are given in the table 4.8 and 4.9. Every single EFA performed for each factor has extracted only a single factor and all the load of the items are high and it is an evidence of their reliability. The Alpha Cronbach (αc) and Composite reliability values of each latent factor are greater than the threshold of 0.7 and the inter reliability is confirmed. By analyzing the AVE of each of the 5 factors, it is possible to note that all the values are greater than 0.5 and all the items included show a significant load ($t > 2.58$) it could be stated that the scale has a good level of convergent validity.

As concerned the discriminant validity evaluation, all the off-diagonal elements values are less than the value of the square root of AVE of each factor as it could be assessed by the table 4.10. It is important to stress that the correlation between the Ride factor and the Empathy one is more than .4 and it is probably due to the one assess the PSP professional competences and the other one the personal ones and this two aspects are naturally related.

RS-RID		RS-SOR		RS-EMP		RS-SI		RS-ECO	
RS-TAN1	0,924	RS-SOR1	0,886	RS-EMP2	0,823	RS-SI1	0,703	RS-ECO1	0,736
RS-TAN2	0,835	RS-SOR2	0,844	RS-EMP3	0,708	RS-SI2	0,794	RS-ECO2	0,844
RS-TAN3	0,810	RS-SOR3	0,833	RS-EMP4	0,703	RS-SI3	0,749	RS-ECO3	0,759
RS-PSP1	0,692	RS-SOR4	0,690			RS-SI4	0,716		
RS-PSP2	0,755								
RS-PSP3	0,647								

Table 4.8: Loads of the four EFAs of each for each RH factors extracted.

	1	2	3	4	5
αc	0.923	0.896	0.799	0.784	0.780
αc if one item is removed	0,901-0,923	0,836-0,902	0,646-0,823	0,674-0,752	0,673-0,751
Range of correlations between items and total corrected scale	0,677-0,841	0,667-0,847	0,555-0,729	0,551-0,695	0,574-0,645
RC	0.903	0.888	0.790	0.830	0.824
AVE	0.613	0.667	0.557	0.550	0.610

Table 4.9: Statistics of the four EFAs of each for each RH factors extracted.

	1	2	3	4	5
RS-RID	0.783				
RS-SOR	0.288	0.816			
RS-EMP	0.447	0.032	0.747		
RS-SI	0.243	-0.067	-0.041	0.742	
ER-ECO	0.382	0.24	0.072	0.301	0.781

Table 4.10: correlation matrix of RS latent factors

The next phase of the validation process is to confirm the model through the confirmatory factor analysis (CFA) details of which are given in the table 4.11. The Satorra-Bentler χ^2 value is 364 with 160 degrees of freedom and a p-value associated is null and less than the value recommended of 0.05. The CFI and RMSEA also confirm that the data don't fit with the scale model proposed with a value of 0.778 and 0.135 respectively. Like in the previous case, the size of the sample used of 71 is not adequate to this type of analysis and the results could be distorted. It is, therefore, not possible to state that the RS-qual model fits with the data and this analysis should be re-performed with a larger sample.

Dimensions	Items' code	Load	t-value	r^2
Ride				
	RS-PSP1	0.869	\	0.775
	RS-PSP2	0.850	9.34	0.722
	RS-PSP3	0.855	11.01	0.732
	RS-TAN1	0.765	7.04	0.585
	RS-TAN2	0.68	6.25	0.462
	RS-TAN3	0.874	10.2	0.764
Site Organization				
	RS-SOR1	0.815	\	0.664
	RS-SOR2	0.937	8.68	0.878
	RS-SOR3	0.812	11.03	0.659
	RS-SOR4	0.739	5.49	0.546
Empathy				
	RS-EMP1	0.612	\	0.375
	RS-EMP2	0.81	5.51	0.657
	RS-EMP3	0.862	4.54	0.744

Social Interaction				
	RS-SI1	0.661	\	0.437
	RS-SI2	0.852	9.6	0.727
	RS-SI3	0.608	5.91	0.369
	RS-SI4	0.64	4.95	0.409
Economic				
	RS-ECO1	0.859	\	0.723
	RS-ECO2	0.707	6.21	0.500
	RS-ECO3	0.637	4.81	0.405
Goodness of fit summary				
Satorra-bentler scaled χ^2		364		
Dof		160		
P-value		0.000		
χ^2/df		2.272		
CFI		0.788		
RMSEA		0.135		
90% Confidence interval of RMSEA		(0,116-0,152)		

Table 4.11: RS-scale confirmatory analysis

The final version of RS-scale proposed is composed by 5 quality dimensions and 20 items. This structure, as stated before, has not passed the CFA and it should be confirmed by using a larger sample. The RS-scale proposed in this study does not consider the CFA and it should be considered ad an initial point for future researches.

The dimensions inserted in the final scale are related to the quality perceptions of the ride service (driver and car) and the empathy showed by the driver, the e-quality of the website/app used, the economic aspects and the social interaction experienced by the use of this type of service. Except for the Social Interaction dimension which is specific for the ride-sharing service, the dimension level structure of the questionnaire is the same of the RH case. Only slight changes could be found such as more items considered in the Economic dimension or different items deriving from the PSP competence category. As in the RH-scale, the characteristics of the appearance of the shared cars and the PSP professional competence are in the same quality dimension labeled for this reason “Ride” in both cases. Although the phase of this study is an explorative one, the obtaining of the same results emphasizes the relevance of the quality aspects of the sector analyzed, Car-shared-mobility, and it could support the consistent and the robustness of the findings.

The final structure of RS-scale is given in the table 4.12 below including all the relevant dimensions and items and two item' codifications: one assigned at the literature review step (column: "Code") and the other one assigned after the validation process (column: "New code").

Dimensions	Code	New Code	Items
Site Organization	RS-SOR1	RS-SOR1	The information of app/website is well organized.
	RS-SOR2	RS-SOR2	The app/website is easy to use.
	RS-SOR3	RS-SOR3	The app/website makes it easy to find what I need.
	RS-SOR4	RS-SOR4	The app/website makes it easy for me to conclude my transaction.
Economic	RS-ECO1	RS-ECO1	For the given price, I rate the service offer as good.
	RS-ECO2	RS-ECO2	For the given quality of the service offer, I rate the price as good.
	RS-ECO3	RS-ECO3	The company offers more affordable prices than traditional transportation services
Ride	RS-PSP1	RS-RID1	The driver is competent at serving the customers.
	RS-PSP2	RS-RID2	I can rely on the driver to finish the part of riding.
	RS-PSP3	RS-RID3	The driver is good at what he/she does.
	RS-TAN1	RS-RID4	The car is comfortable.
	RS-TAN2	RS-RID5	The car is visually appealing.
	RS-TAN3	RS-RID6	The car is clean.
Empathy	RS-EMP1	RS-EMP1	The driver acts in a customers' best interest.
	RS-EMP2	RS-EMP2	If a customer requires help, the driver does the best to help
	RS-EMP3	RS-EMP3	The driver is interested in customer well-being, not just his/her own well-being.
Social Interaction	RS-SI1	RS-SI1	The use of the service allows me to develop social relationships.
	RS-SI2	RS-SI2	I enjoy myself sharing a ride with new people.
	RS-SI3	RS-SI3	I usually find a friendly environmental when I shared a ride.
	RS-SI4	RS-SI4	I feel safe sharing a ride with other people I don't know using the service.

Table 4.12: RS-scale proposed for ride-sharing services

4.1.3 CS-scale validation

The first step for validation process of the car-sharing data, the test of the adequacy of the dataset for the EFA, has positive results. In fact, the value of KMO is 0.603, slightly above the threshold of 0.6 and the p-value of the Bartlett sphericity test is zero and it means that the dataset collected is suitable for the factoring.

In the table 4.13 for each factor extracted by the EFA is shown the load of each variable, in red the loads greater than 0,6, the recommended threshold, and in the last row, the percentage of the variance explained by each latent factor.

Items	CS-SOR	CS-TAN	CS-PRA	CS-LPT	CS-CON		
CS-SOR3	0.877	0.193	0.066	-0.156	0.031	-0.079	0.097
CS-SOR2	0.860	0.008	0.122	-0.003	0.013	0.040	0.121
CS-SOR4	0.780	0.053	-0.087	-0.076	0.138	0.143	-0.158
CS-SOR1	0.745	0.137	0.050	0.131	0.102	0.147	-0.007
CS-SOR6	0.386	0.007	0.289	0.184	0.204	0.274	0.335
CS-TAN3	0.005	0.912	0.022	0.081	-0.128	-0.053	-0.073
CS-TAN1	0.032	0.815	-0.196	0.190	-0.026	-0.177	-0.117
CS-TAN2	0.310	0.751	0.051	-0.230	-0.164	0.146	0.298
CS-TAN4	0.092	0.728	0.112	0.083	0.026	0.178	-0.159
CS-ECO2	0.350	0.480	0.074	-0.326	0.158	-0.013	0.032
CS-PRA2	0.187	0.055	0.804	0.112	-0.323	0.115	-0.048
CS-PRA1	0.117	0.176	0.804	-0.308	0.052	-0.180	0.099
CS-PRA3	-0.024	-0.090	0.757	0.290	-0.016	-0.022	-0.312
CS-ECO3	-0.058	-0.085	0.639	0.032	0.032	0.406	0.094
CS-LPT3	0.004	0.099	0.076	0.806	-0.049	0.145	-0.161
CS-LPT4	-0.088	0.110	0.056	0.790	0.012	-0.199	0.228
CS-C1	0.148	-0.044	0.066	-0.012	0.847	-0.076	-0.033
CS-C3	0.095	-0.064	-0.266	-0.089	0.795	0.123	0.121
CS-ECO1	0.094	0.172	0.009	-0.071	-0.172	0.803	-0.020
CS-SOR5	0.151	-0.088	0.018	0.034	0.466	0.608	0.081
CS-C2	0.166	-0.153	0.334	0.406	0.209	0.547	0.069
CS-LPT2	0.020	-0.103	-0.058	0.001	0.120	-0.021	0.872
CS-LPT1	0.045	-0.158	-0.129	0.588	-0.233	0.264	0.592
% of variance	13.926	13.786	12.427	9.745	6.641	5.945	5.441

Table 4.13: CS Components' rotated matrix

The common factors extracted by the EFA are 7 in total with a value of variance explained of 67.91%. Only the first five ones of the total factors have been considered in the final model of the analysis; in fact, the last two factors have been considered irrelevant because

of the low level of variance explained and because they contain items which cannot be directly linked. The final percentage of variance explained by the five factors is 56,52%.

The first factor extracted is composed by all the items of the original dimension "*Site Organization*" (CS-SOR) (CS-SOR1, CS-SOR2, CS-SOR4) and its label is, therefore, the original one. This factor explains 13.92% of the variance and it assess the quality aspects liked to the e-quality of the app or website used to provide the car-sharing service to the final customers as the ease of use and of find information and to conclude the transaction process.

The second common factor extracted is labeled with *Tangibles* (CS-TAN) since it contains all the original items of this dimension. This factor concerns the quality of the physical appearance of the shared car, its comfort (CS-TAN1), its visual appeal (CS-TAN2), its clean condition (CS-TAN3) and the ease of use of the technological equipment installed for the rent (CS-TAN4). The percentage of the variance explained by the factor is 13.78%.

Platform responsiveness (CS-PRA) is the third factor extracted by the EFA and it explains 12.42% of the variance. The items included are all the original ones (CS-PRA1, CS-PRA2, CS-PRA3) related to the assessment of the quality of the quickness with which the platform provider ensures the transaction match. CS-ECO3 from Economic dimension is also included in the factor but its content (service cost effectiveness) has not to do with the other items and for this reason it has not been considered.

The fourth factor resulted by the EFA contains two of the total four items of the dimension Legal protection and trustworthiness. The new definitive label used for this factor is *Legal protection* (CS-LP) since the items included are related to the legal protection provided (CS-LPT3) and to the clarity of the insurance coverage's terms (CS-LPT4). The percentage of the variance explained is 9.74%.

The last and fifth factor resulting by the EFA is *Contact* (CS-CON) and it represents 6.64% of the variance. The dimension assesses the quality of access to the customer assistance service provided and it consists of two of the three original items (CS-C1, CS-C3) related to the ease to access to the service from different channels and the adequacy of the waiting time.

Next step of the validation process is the analysis of the intern-factor reliability and the convergent validity analyses details of which are given the tables 4.14 and 4.15. The independent EFAs conducted for each of the five factors has led to the extraction of a single factor. As it is possible to note, a good level of reliability of each factor extracted is given by a value of composite reliability (RC) greater than the threshold fixed (0.7) for each factor while a value of αc greater than the 0.7 threshold fixed as concerned only the first three factor extracted; the last two factors, Contact and Legal protection, are composed by only two items and this could be the reason why the value of Cronbach's alpha, 0.672 and 0.664 respectively, could be distorted. The reliability of these factor could be considered, however, since the αc values are close to the threshold. The reliability of the individual items is vouched for by their high loads.

The Cronbach's alpha value doesn't improve when an item is removed from the scale and the average variance extracted (AVE) of each factor is greater than 0.5 which is the recommended threshold. Convergent validity is confirmed for each factor and all the items include have significant values ($t > 2.58$).

Table 4.16 shows the statistics for discriminant validity analysis. As it is possible to note, all the off-diagonal elements values are less than the value of the square root of AVE of each factor reported in the main diagonal of the matrix and it means that the discriminant validity analysis has positive results.

CS-SOR		CS-TAN		CS-PRA		CS-LP		CS-CON	
CS-TAN1	0.839	CS-SOR1	0.910	CS-PRA1	0.764	CS-LPT3	0.870	CS-C1	0.865
CS-TAN2	0.780	CS-SOR2	0.891	CS-PRA2	0.871	CS-LPT4	0.870	CS-C2	0.865
CS-TAN3	0.925	CS-SOR3	0.869	CS-PRA3	0.774				
CS-TAN4	0.748	CS-SOR4	0.796						

Table 4.14: Loads of the four EFAs of each for each CS factor extracted.

	1	2	3	4	5
αc	0.841	0.837	0.772	0.672	0.664
Range of αc if one item is removed	0,740-836	0,716-0,836	0,621-0,740	\	\
Range of correlations between items and total corrected scale	0,602, -0,815	0,576-0,826	0,567-0,670	\	\

RC	0.895	0.924	0.846	0.862	0.856
AVE	0.682	0.753	0.647	0.757	0.748

Table 4.15: Statistics of the four EFAs of each for each CS factor extracted.

	1	2	3	4	5
CS-TAN	0.805				
CS-SOR	0.233	0.817			
CS-PRA	0.037	0.139	0.754		
CS-LP	0.108	-0.079	0.118	0.798	
CS-CON	-0.136	0.203	-0.191	-0.105	0.821

Table 4.16: Correlation matrix of CS-scale latent factors

To set up the definitive scale, the final step is to analyze the CS-scale by performing a confirmatory factor analysis. Also, in this case, the sample's size is not appropriate for the typology of analysis because it is not enough large, and the fit indicators could be negatively affected. The CFA, statistics of which are given in the table 4.17, reported a Satorra-Bentler χ^2 value of 164 with 105 degrees of freedom and a p-value associated is 0, less than the value recommended of 0.05. Although the p-values of the items are all significant (t> 2,58), the incompatibility between the data and the model is also confirmed by the CFI and RMSEA with a value of 0.778 and 0.135 respectively. The goodness of fit summary is not good, and it is not possible to affirm that the CS-scale model fits with the data; the analysis should be re-performed using a sample of an adequate size.

Dimensions	Items' code	Load	t-value	r^2
Site Organizzation				
	CS-SOR1	0.614	\	0.378
	CS-SOR2	0.789	4.31	0.623
	CS-SOR3	0.929	3.33	0.864
	CS-SOR4	0.756	2.86	0.572
Legal Protection				
	CS-LPT3	0.735	\	0.541
	CS-LPT4	0.698	2.727	9.487
Platform responsiveness				
	CS-PRA1	0.581	\	0.337
	CS-PRA2	0.96	3.98	0.921
	CS-PRA3	0.619	4.19	0.383

Tangibles				
	CS-TAN1	0.756	\	0.571
	CS-TAN2	0.702	3.2	0.493
	CS-TAN3	1	5.24	1.000
	CS-TAN4	0.336	2.72	0.113
Contact				
	CS-C1	0.476	\	0.226
	CS-C2	0.634	2.94	0.402
Goodness of fit summary				
Satorra-bentler scaled χ^2			164.809	
Dof			105.000	
P-value			0.000	
χ^2/df			1.570	
CFI			0.746	
RMSEA			0.127	
90% Confidence interval of RMSEA			(0,098-0,153)	

Table 4.17: CS-scale confirmatory analysis

The final version of the CS-scale proposed is the result of an initial exploratory phase of analysis. As it is described previously, the scale has not passed the CFA step aimed to confirm the final dimensions of the survey. Except for the CFA, all the validation process phases have been positive and the final version of CS-scale proposed is composed by 15 items included in 5 quality dimensions. The quality aspects considered are related to the e-quality of the app or website, the legal protection provided to the drivers of the service, the willingness and quickness of response of the platform provider, the ease of access to the customer assistance service and the perceptions about the physical appearance of the shared vehicles. This structure should be confirmed by a CFA, but it could be an initial point for future researches.

The table 4.18 (next page) shows all the relevant dimensions and items included in the CS-scale proposed including two item' codifications: one assigned at the literature review step (column: "Code") and the other one assigned after the validation process (column: "New code").

Dimesions	Code	New code	Items
Site Organization	CS-SOR1	CS-SOR1	The information of app/website is well organized.
	CS-SOR2	CS-SOR2	The app/website is easy to use.
	CS-SOR3	CS-SOR3	The app/website makes it easy to find what I need.
	CS-SOR4	CS-SOR4	The app/website makes it easy for me to conclude my transaction.
Platform responsiveness	CS-PRA1	CS-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.
	CS-PRA2	CS-PRA2	The company takes care of problems promptly
	CS-PRA3	CS-PRA3	The company offers fair compensation for its mistakes.
Legal protection	CS-LPT3	CS-LPT1	The legal structures adequately protect me from problems with the company.
	CS-LPT4	CS-LPT2	The terms of the insurance coverage provided are clear and easy to understand.
Contact	CS-C1	CS-C1	I can access to the customer assistance by different channels (online, by email, by a voice call)
	CS-C3	CS-C2	The waiting time for receiving assistance is adequate
Tangibles	CS-TAN1	CS-TAN1	The car is comfortable.
	CS-TAN2	CS-TAN2	The car is visually appealing.
	CS-TAN3	CS-TAN3	The car is clean.
	CS-TAN4	CS-TAN4	The technological equipment installed on the car allows to start and to end the rental easily.

Table 4.18: CS-scale scale proposed for car-sharing services

Chapter 5

Quality reports

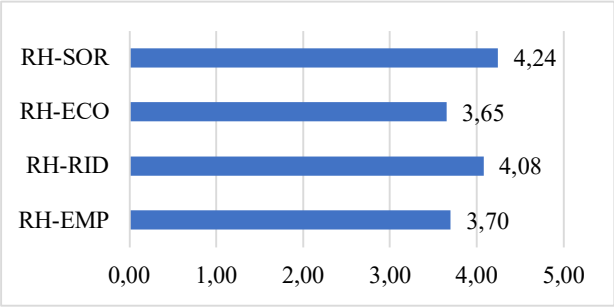
5.1 Quality reports of RH-scale, RS-scale and CS-scale

In this section, the analysis of the quality scores obtained for each surveys will be analyzed with the aim to understand which are the strengths and weakness of services by a quality point of view and propose business suggestions for the companies operating in the sharing mobility context. In each of the follow subsections, for each typology of service, RH, RS and CS, the average quality-scores will be reported and analyzed. The average of the quality scores been measured for each dimension as the average value calculated considering all the items included in the final version of the three questionnaires obtained the validation process.

It is important to stress that all the quality scores obtained are based on very small samples and they could be not close to the realty. Furthermore, it is necessary to analyze a specific CC company to understand its specific poor-quality aspects in order to suggest improvements. The collection of the data, instead, is based on samples of users of different CSM companies and of a restrict groups. All the consideration that will be done are generic and based on the average quality attitude of the customers. This analysis should be improved by using larger samples and by restricting the number of firms in order to find the real weakness.

1. RH-scale quality scores

The averages scores obtained by the collection of data from the RH-survey are reported in the graphic on the left (graphic 5.1). As it possible to note, the scores have been calculated by considering the structure of the survey obtained after the validation process



Graphic 5.1: RH-scale average quality scores

(see table 4.6, chapter 4). The quality dimensions that have be highest rated, are *Ride* and *Site organization* dimensions reporting a score greater than 4.0 on average. As it was expected, the dimension Ride resulted important in the ride-hailing context in which both the driver and the car are in direct contact with the final user and they principally affect their perception. In fact, ride-hailing services proposal is to provide a ride to customers and the driver is the person who deliver the service and serve the final customer directly. All the aspects related to the vehicles and the drivers must be accurately managed by RH companies. Also the assessment of the website/app used to access to the service has resulted significant with the highest score of 4.24 on average. The use of the app and, so, its ease of use and the organization of information is fundamental to provide an efficient service to customers who use the interface to book, contact the driver and manage payments. The dimension Site organization's intent is to evaluate, in fact, the functionalities of the online app provided by the company and, therefore, the ease of finding what a customer needs by it, the ease of use and the to conclude the transactions, all the principal actions which allow users to use in a simple way the service.

As concern the *Economic* dimension, the quality score related to the features linked to the cost-effectiveness of the service is on average 3.65. It is interesting to stress that, in this case, only one of the two items included in the dimension has been rated low by customers and it is RH-ECO2 with an average score of 3.1. RH-ECO2 refers to the economic convenience of ride-hailing compared to the traditional mobility services as public transport, the use of the own car or taxi services. This issue is particularly important if the comparison service is the taxi since those service are equal with the difference that the RH driver is a no-licensed driver. This economic hatred between taxi services and ride-hailing is the main cause for which RH is not allowed in some countries as, for instance, in Italy and drivers can provide rides without buy the expensive license and without all the legislation limits. The low ratings are to be analyzing considering not only the convenience compared to taxi but also the public transport mobility services and the use of a own car. In order to understand the cause of this low rating it is necessary to analyze the specific price strategy used by a company and understand the real motives of the un-satisfaction of customers. On the other hand, RH-ECO1, which assess the quality-price ratio, the average attitude of customers is, in this case, better than the previous case, with a mean of 4.2. This means that, in comparison with the quality delivered, the price

proposed is evaluated as good but, in comparison to the other traditional services, it is perceived as not good. The RH companies should improve their price strategies considering all the potential competitors including all the traditional mobility services and proposing a service more convenient than the other ones.

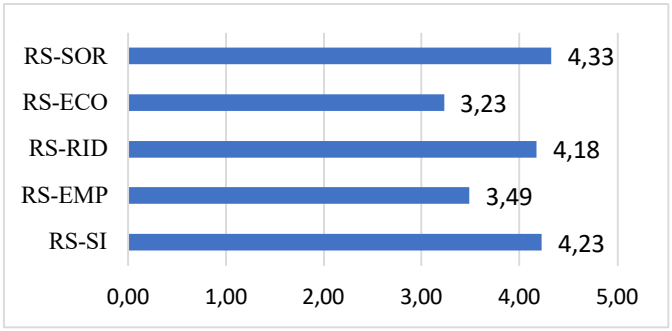
The *Empathy* dimension's score is on average good and close to 4.0. This quality dimension, assessing the cost-effectiveness and the benevolence of drivers of the service, is difficult to manage by the company provider. In fact, this "personal" competences depends directly on drivers as individuals and their willingness to support customers is not easy to improve. In order to improve this aspect, RH companies should carry out specific training courses provided online in order to instill the right way to serve customers or by putting thresholds of acceptance to the average score calculated using the ratings given by customers. In this way, the drivers are pushed to serve in the best way the customers showing both professional and personal competences.

To summarize, the general framework of the perceptions of the ride-hailing service is good considering that all the dimensions quality scores are on average greater than 3.7 points of the Likert scale. The quality dimension which have resulted strong by a quality point of view in ride-hailing are the characteristics of the website/app and the comfort, cleanliness and visual appealing of shared cars used in the service. As regard the weaknesses quality factors, they resulted the quality-price ratio perceptions and convenience and the PSPs' empathy related to the willingness and benevolence of drivers to help customers. RH companies should improve the quality level of this two specific aspects by changing the price strategy and caring about the PSPs' personal characteristics by training them through courses shared in order to serve the customers in the best way.

2. RS-scale quality scores

The graphic 5.2 (next page) reports the average quality scores of RS-scale calculated by considering its final version after the validation process (see Table 4.11, chapter 4). As it

possible to note, the dimensions resulted most important and with the more positive attitude of customers are *Site organization* (RS-SOR), *Ride* (RS-RID) and *Social Interaction* (RS-SI) with an average score greater than 4.0 on the Likert scale. This result is equal to the previous case of ride-hailing except for the Social interaction dimension that is specific for this type of service and not present in the RH-scale. Also in this case, the RS users use a single interface by their smartphone to see al the free rides, book ones, see all the information about drivers and passengers with whom share the ride and to conclude the transactions. An ease to use and an efficient online application/website is necessary to reach a high level of quality service because it is the means through which both potential and effective passengers could use the service and the "face" of the company provider. Also the ride quality aspects have been rated with an high score and this means that RS companies should act to control the competences of drivers and of appearance of their cars, though, for instance, periodical surveys to users and by allowing only to those drivers with an average rating greater of a threshold fixed to join the service or through periodical inspections.



Graphic 5.2: RS-scale average quality scores

About the Social interaction quality dimension, the quality score is on average 4.23. The high quality score was possible to be predicted since the social interaction, as stated in the previous chapters, is the core of this typology of service in which customers seek for a mobility service as well as a social experience in which meet new people with whom share a trip. A high perceived quality level of this aspect is fundamental and, on the same time, difficult to manage and improve because it encloses concepts as trust in the others and in the platform, reliability of information and the feeling safe with new people. RS companies should work on the collection of the information, systems to certificate the users and on reliability of the ratings system in order to convey reliability, security and trust to customers. It is important to use some mechanism as link the users participating in the service with the profiles of social networks in order to drive the customer to trust the others and to instill reliability.

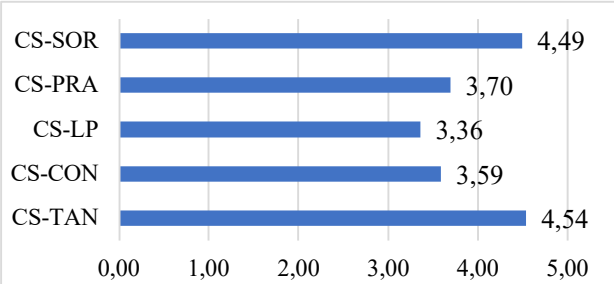
As concern the *Economic* dimension, customer have rated it on average 3.97, slightly higher than the score of ride-hailing scale. Even though the Economic dimensions of RH-scale and RS-scale are slightly different since they contains different items, they both aim to evaluate the general perceptions of the economic aspect of the services. The greater score obtained in the case of the ride-hailing could lead to the wrong conclusion that this typology of service is perceived as more convenient than the other one of ride-sharing. This conclusion should be wrong because the ride-sharing offer is generally more expensive since it is used to move from a city to another while the RH is used to move from a point to another of the same city and the two services are not similar by this point of view. It is not possible to directly compare the two services but, in general, it could be concluded that the aspect of cost-effectiveness should be improved in both the cases. Also in the case of ride-sharing, like in the ride-hailing, the item that has been rated low between the three ones included in the dimensions is RS-ECO3 linked to the convenience of the RS service in comparison with the traditional mobility service (taxi, public transport, own cars etc.). The same considerations made for the ride-hailing are valid also for ride-sharing.

As concern the *Empathy* dimension, the average score is 3.49, a result slightly lower than that one of the same dimension in ride-hailing scale but essentially similar. Also in this case, RS companies should manage this aspect and improve it through training courses and quality controls as periodical analysis of the average ratings of the drivers and, for example, the exclusion of the bad PSPs ones from the service.

To summarize, the customers' attitude to ride-sharing service is generally positive since all the scores of the dimensions are greater than 3 on average. The quality areas resulted with the most positive customers' attitude are resulted the characteristics of the app/website used to access to the service assessed by the *Site organization* dimension and *Ride* dimension which evaluates the professional competences of the driver and the perceptions about the physical appearance of the shared asset assessed. These aspects are perceived by customers qualitatively high as in the case of ride-hailing. The scores obtained in the two services are quite similar and, in each case, greater than 4.0 on average. Also the *Social interaction* dimension, concerning the social encounters of users with other users, has been rated high on average.

3. CS-scale quality scores

The average ratings of CS-scale are reported in the graphic 5.3, calculated considering the final structure of the survey, after the validation process (see table 4.16, chapter 4). The quality dimensions resulted to have the highest scores are Site organization (CS-SOR) related to characteristics of the website/app of used by the CS users to access to the service and Tangibles (CS-TAN) which assesses the physical appearance of the shared cars and the ease of use of the technological equipment installed on them. These quality feature are the most important in the case of car-sharing in which the customer expects to access to service using an efficient app which allows him/her to book a car, reach the car and manages all the transaction in an easy way by a user-friendly user interface. Furthermore, the physical aspects of the vehicle directly driven by users are to be considered significant in the same way the characteristics of a room are important for a client of a hotel. In fact, CS users decide to use the service driven by both utilitarian reasons but also to use good-looking vehicles they don't own and probably they won't buy but that they can use paying the usage through the CS platform. Also their comfort and the state of cleanliness became important aspect which are reflected in a good image and reputation of the company. These two dimensions evaluate, at the end, they way through which a customer access to the service, the app/website, and the service itself, the car to be rent.



Graphic 5.3: CS-scale average quality scores

About the other dimensions as *Legal Protection* (CS-LP), *Platform Responsiveness* (CS-PRA) and *Contact* (CS-CON), they resulted only in the final version of CS-scale and they were eliminated by the validation process in the other two services' scales. In CS, contrary to the others service typologies, users rent and drive the vehicle and they are the directly responsible for all their actions. This should justify the relevance of aspects as legal protection and insurance coverage, the responsiveness of the platform to customers' problems or requests and the access to the assistance service in a contest in which the customers run with an higher probability in problems as legal or insurance ones, linked to the rent or, in some cases, to situations of incidents. The quality scores of these

dimensions are, on average, less than 4.0 and this suggest that the car-sharing companies have to better care about this aspects. As concern the legal protection provided, the item which has been worst voted is CS-LP2 (new code) with an average score of 3,32. The item assesses the clearness of the terms of the insurance coverage and it resulted as a critical aspect that the CS companies have to improve for example by providing more information on the website/app and by explaining the legal risks and the consequences , the conditions of the insurance coverage and all the terms with a simple language. The lower score of CS *Platform responsiveness* is that one of *CS-PRA2 while CS-C2 (new code)* that one of CS *Contact (CS-CON)* with average scores of 3,46 and 2,95 respectively. These items evaluate the readiness of the company to care about the customers' problems and the waiting time to access to the assistance service respectively and they are both linked to the promptness to assist the final client. This aspects are resulted qualitatively poor and the companies operating within the CS business should introduce improvements in order to provide an instant support to their customers implementing new channels to access to the assistance as instant chat in the app/website or generally fast access, or increasing, if necessary, the number of the assistance staff if it turs out to be the process bottle neck.

To summarize, the quality aspects of car-sharing resulted strong in a quality point of view and rated more than 4.0 on average on the Likert scale are the organization of the site, and so the ease of use of the online app or website, the ease of make transaction and of find what a customer needs and the features linked to the physical aspect of shared cars, their comfort, visual appealing, state of cleanliness and the ease of use of the technological equipment installed; as concern this aspect, it is assessed by an item added specifically for the car-sharing in which users could start and end the rent automatically thanks to the technology used on the cars. The quality areas rated lower than 4.0 points on average are these concerning the responsiveness of the platform, the legal protection provided to users by the company and the access to the customer assistance service. All these aspects resulted qualitatively poor CS companies should care about All these aspects resulted qualitatively poor in order to improve the general level of the quality of the service provided.

Conclusions

The aim of this thesis work has been the development of measurement scales of the three services aimed to assess the quality of ride-hailing, ride-sharing and car-sharing and, therefore, to question about the different factors affecting customers' perceptions of perceived quality.

The idea behind the work was to analyze the different services models operating in the in sharing mobility context, providing a mobility facility to customers and basing their business on an online platform and on the sharing of vehicles. Thought a multiple-service models evaluation, it has been possible to understand that the services considered, although they presented similar aspects, were characterized by different and specific aspects and that a generic quality scale was not adequate. The aim of this work was to stress both common aspects and differences of the services considered, focusing on the distinct factors affecting customers' quality perceptions, in order to develop scales able to assess all the specificities of each mobility service.

Through the analysis of the previous literature is has been possible to capture to reach a theoretical framework about the concept of service quality and about the collaborative consumption phenomenon and to understand the broader context related to the factors affecting customers' perceptions and behavior. Among the past works analyzed, the theoretical framework chosen as the basis for the development of the scales has been the instrument developed by Marimon and his team (Marimon et al, 2019) called CC-qual. This choice has been driven by the analysis of the different quality assessment works from the past literature and it has been carried out because the scale was based on both E-S-QUAL and SERVQUAL Parasuraman's scales, widely used in different socio-economical and geographical contexts and proved to include all the critical dimensions for the assessment of the quality and for the achieving of business aims (e.g. discussed by Agarwal & Venkatesh, 2002; Devaraj, Fan & Kohli, 2002; Ladhari, 2008; Ladhari, 2009; Loiacono, Watson & Goodhue, 2002; McKinney, Yoon & Zahedi, 2002). Furthermore, since the goal of the thesis was to develop different scales for three different

CC services, the choice has been a general scale aimed to assess the quality of any service operating in CC in order to adapt it to the three different service's contexts.

After the review of the past literature, the next phase has been the analysis of the general business industry of car-sharing mobility and of the different service's models including in it, ride-hailing, ride-sharing and car-sharing, with the aim to capture the general industry context's features and all the specific characteristics of the services analyzed. All the service included provide the same final service, but they present specific features in their providing model. In order to understand the specific factors affecting each service-type's quality, the approach used has been the analysis of all the domains concerning the possible interactions involving the final customer since all the related features were directly related to their perceptions. Through the analysis of the specific service-contexts, it has been stressed that the interaction involved the final customers in each service were different and that a single measurement scale generic for all the mobility services considered was, therefore, not adequate. For each of these interactions and for each service scale, a set of important dimensions and items have been proposed and included.

The domains analyzed for ride-hailing scale have been related to the three interaction the customer established using the service: with the platform, referring to the contact to the website/app provided by the company, with the vehicle and with the PSP, identified in the RH driver. All these domains have resulted in common with the ride-sharing service and, in addition, a new interaction has been analyzed related to the social encounter with other users. In fact, RS allows a group of users to share a trip and to directly establish social relationship. RS users decide, in fact, to participate in RS driven by social reasons, as well as by utilitarian reasons. As concern the car-sharing scale, the domains analyzed have been the interaction with the platform and the vehicle since the figure of the PSP has been resulted relevant only for a car-sharing configuration and, therefore, it has resulted not a general domain.

The three questionnaires have been sent to three different samples of customers who have used the service one time in the last year at least and were familiar with this typologies of service as students or principally young people. After the collection of the data, the scale validation process has been carried out, including an exploratory factor analysis (EFA), a reliability inter-factor and validity analyses and finally a confirmatory factor analysis

(CFA) aimed to confirm the final scales' structure. The results of these analysis have been positive for each scale and each analysis' step except for the CFAs that resulted negative in any case. For this reason, it hasn't been possible to confirm the final structure with the hope that, in future researches, these data could be used and the analysis reperformed with larger samples.

The table 6.1 shows a summary of the results obtained in each step of the development of the scales about the dimensions and the number of items included in the initial phase based on the literature review and after the EFAs.

	Dimensions proposed	Literature review	EFA	Definitive dimensions
Ride-hailing	Site organization	4	4	Site organization
	Platform responsiveness	3	\	
	Legal protection and trustwothiness	4	\	
	Contact	3	\	
	Economic	3	2	Economic
	Tangibles	3	3	Ride
	PSP competences	4	3	
	PSP empathy	3	3	PSP empathy
Ride-sharing	Site organization	4	4	Site organization
	Platform responsiveness	3	\	
	Legal protection and trustwothiness	4	\	
	Contact	3	\	
	Economic	3	3	Economic
	Tangibles	3	3	Ride
	PSP competences	4	3	
	PSP empathy	3	3	PSP empathy
	Social interactions	4	4	Social interactions
Car-sharing	Site organization	6	4	Site organization
	Platform responsiveness	3	3	Platform responsiveness
	Legal protection	4	2	Legal protection
	Contact	3	2	Contact
	Economic	3	\	
	Tangibles	4	4	Tangibles

Table 6.1: Number of items of each step and definitive dimensions foe each scale proposed

The interaction with the platform has been analyzed and assessed in all the three service-scales since, in all the car-shared mobility services, the customer interacts with the

platform, an app or a website to access to the service, manage transaction, access to the customers' assistance service and search all the information needed.

The first dimension resulted in this domain has been *Site Organization*. The items included in this dimension have been the same ones for each service-scale assessing the organization of information of the app/website and its design, and the way they are displayed in order to allow a ease usage and easy transaction processes by it. This dimension hasn't been dropped out by the EFAs and it has been included in all the three final versions of the scales. All the original 4 items have been included in the final version of the ride-hailing and ride-sharing scales; as concern the car-sharing scale, two additional items have been proposed in the first step concerning the ease of doing car-damage reports by the app and to reach the car a customer should rent by the app. These two items have been included for the specific case of car-sharing in which CS platforms may allow customers to know the precise position of a car and to easy reach it, and to report damages if they are present in order to manage the allocation of responsibilities. These two items have been dropped out by the EFA and the final dimension's items are the same one included in the other two scales. The inclusion of Site organization dimension in the scales is consistent with E-S-QUAL of Parasuraman and with the theoretical framework chosen, the CC-qual. Mohlmann (2015) didn't state that this dimension is an antecedent of the satisfaction of customers and also Cheng et al. (2018) didn't include a similar dimension in the scale. The finding of this thesis work lead, therefore, to state that the characteristics of the website/ap, the design and its usability and the ease to transact are relevant features any company operating in-shared mobility should care about.

The second dimension resulted in the platform perceived quality domain has been *Platform responsiveness* assessing the promptness of the platform provided to answer and take care about customers' problems and complains. The features related to this dimension have been resulted common for each type of services since final customers expect to use a service provided by a company which cares about them and all their problems and questions. The dimension hasn't been included in the final version the scales since it has been removed by the EFAs except for the car-sharing. Other dimensions have been proposed for each service-scale but resulted only in the CS-survey as *Legal Protection*, linked to the worry felt by customers that something goes wrong using the service and to the legal protection mechanisms provided by the company and *Contact*

linked to the ease of access to the assistance service. As concern *Legal protection*, a new additional items has been own developed and included in the CS-survey assessing the clearness of the terms of the assurance coverage provided to all the users of the service due CS allows customers to drive a car without care about a personal car-assurance. This items hasn't been removed by the EFA and included in the final CS-scale dimension together with another item related to the adequate protections from problems with the company given by the legal structures provided. *Legal protection* dimension could be described, therefore, as the factor assessing the adequacy of the legal protection structures provided by the CS company (including the coverage assurance) and the clearness of the terms of the assurance referring to the info shared by the platform about this topic. This aspect hasn't been assessed in the previous works and it has been proved to be relevant in this study. As concern the dimension *Contact*, only two of the three original items have included in CS-scale after the processing of the EFA related to the ease to access to the customer assistance service by different channels (online, by email, by a voice call) and the adequacy of waiting time to access.

The exclusion of *Platform Responsiveness, Legal protection and Contact* dimensions is not consistent with the past literature (e.g. Parasuraman et al. 1985, 1988; Marimon at al., 2019, Cheng et al., 2019) but it is important to stress that the study is in a preliminary exploratory phase and that the final structure of the scales has not been confirmed since all the CFAs have had negative results. The analyses, therefore, have been proposed to be used by future researches and to enrich the literature about collaborative consumption with the hope that future study will re-perform them and propose final scales.

The *Economic* dimension has been the last relevant dimension included in the platform perceived quality's macro area. Although all the initial version of each of the three surveys contained this dimension with the same items, it has been removed by the EFA only in the case of car-sharing survey. The other two questionnaires, ride-hailing and ride-sharing, both have included this dimension after the performing of the EFA but with different items. The importance of the economic benefits and cost saving as a result of using sharing services has been stressed by many author; for instance Mohlamann (2015) found cost savings as one of the relevant determinant in choosing a sharing option and Benoit (2017) stressed that the economic motives drive customer to use CC services. The exclusion from the car-sharing scale has not a strong justification but also, in this case, it

is a result of a exploratory analysis and the scale's final structure should be confirmed basing the analyses on a larger sample.

The further domain analyzed and resulted common for each of the three typologies of service has been the interaction with the car, relevant for each mobility service due each service provide a car-shared mobility facility. All the characteristics concerning the physical appearance, visual appealing and comfort of the shared vehicles have been assessing by the inclusion of *Tangibles* dimension in the three surveys with the same items and in no case has been removed by the EFA and all the original items have not been removed too in each survey-case. The inclusion of this dimension in each survey is consistent with SERVQUAL although Cheng (2018) and Marimon (2019) didn't insert it in their scales. The relevance of the characteristics regarding the physical appearance of vehicles in the specific context of sharing mobility is clear since the customer direct interact with the cars and the finding of this work are consistent with this consideration.

The interaction with the PSP has been analyzed only in the case of ride-hailing and ride-sharing since the economic figure has been found only the specific P2P business model of car-sharing and it has been considered not relevant for a generic car-sharing service interaction. Two dimensions have been included: PSP competence, assessing the perceptions about the professionalism of drivers and PSP Empathy linked to the human side of PSPs and their benevolence and willingness to help customers. In both the cases, ride-hailing and ride-sharing, the results have been equal with slight differences. In fact, in both the surveys, the EFA has stressed the correlation between the items included in the PSP competence dimension and in Tangibles one leading to a unique dimension called Ride since it assessed all the features of a ride, the driver and the car. *Empathy* dimension has resulted as a different factor in both the RH-scale and RS-scale final versions although it assess also the characteristics of the drivers. The correspondence between ride-hailing and ride-sharing scales stress the robustness of the results obtained. These findings are also consistent with Cheng (2018), in which professional competences and empathetic ones are assessed by two different dimensions.

Only in the specific case of ride-sharing, a further domain has been analyzed concerning the interaction between the other users referring to the social interactions the customer developed using the service. The social issue is very critical topic in the generic CC field

but especially for companies operating in ride-sharing industry in which the main proposal is to allow customers to live a social experience as well as to access to a mobility service. The enjoyment in developing social experience sharing a ride with strangers and to feel safe by doing it have been the features assessed in the final version proposed for ride-sharing service scale.

The last step of this work has been the analyses of the quality average scores of each survey with the aim to carry out a dimension's quality ranking of the different services considered and to analyze the weakness and the strengths of each service-context. The quality scores have been reflected a positive attitude of customers on average since all the dimensions of each scales have been greater than 3. In each service-case, *Site organization* dimension's average quality score has resulted greater than 4 points of the Likert scale supporting the idea that all the typologies of service analyzed provide ease to use and efficient website/applications. Also in this analysis, similar results have been found for RH and RS. In both the cases, the analysis of the quality scores has stressed the need of the company to improve the perceptions about the cost effectiveness of the service by changing the price strategy and considering all the traditional services (taxi, public transport and cars) as competitors and the empathy of the drivers improvable through a greater attention and control of the customers ratings about drivers and with training courses in order to instill the right way to serve. As concern the car-sharing companies, according to the data collected, they should improve the assistance and support to the final customer by including new ways to contact the company as instant chats or other fast accesses or increasing the number of employers aimed to provide assistance, if it is necessary. Limitations of this quality scores analysis have been the impossibility to do a direct comparison analysis between the quality level of the different services since the scales are structured differently and that all the suggestion given as a result of this analysis are general and a specific firm has to be analyzed in order to understand its weakness and strengths and propose improvements.

It is important to state that some limitations are present in the thesis work. The main one is that it hasn't been possible to confirm the final structure of the scales since the CFAs have led to negative fitting statistics in each service case. The reason could be found in the use of small samples caused by difficulties in the collection of the data, not supported by any companies and, for this reason, the results of CFAs could be resulted distorted and

not truthful. It is important to underline that the present work is an exploratory and preliminary analysis phase and the findings have been provided to support future researches and enrich the knowledge about the service quality, with the hope that, in the future, the studies could be reperformed by using larger and more diversified samples including different socio-economic and geographical contexts, reaching more robust and consistent results.

Although these limitations, the thesis work provides a contribution to the existing literature on the assessing the quality of service included in CC industry and, specifically, of car-sharing mobility services. The work has added new knowledge about the different quality factors affecting the quality of the three services considering by providing a multiple service analysis based on the highlighting of the differences and communalities of three different services. As concern the practical field, these study could be useful for managers of companies operating in the car-shared mobility sector on in general in CC, to understand customers' needs and the factors affecting their perceptions and attitude and for customers to reach a general view of the service provided.

Appendix

Appendix 1: Source from the past literature of the items included in the RH-scale proposal

Code	Items	Source
RH-SOR1	The information of app/website is well organized.	Parasuraman et al. (2005)
RH-SOR2	The app/website is easy to use.	Parasuraman et al. (2005)
RH-SOR3	The app/website makes it easy to find what I need.	Parasuraman et al. (2005); Cheng et al. (2018)
RH-SOR4	The app/website makes it easy for me to conclude my transaction.	Möhlmann (2015)
RH-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.	Adapted from Cheng et al. (2018)
RH-PRA2	The company takes care of problems promptly	Parasuraman et al. (2005)
RH-PRA3	The company offers fair compensation for its mistakes.	Ganguli and Roy (2010); Parasuraman et al. (2005)
RH-LPT1	The company provides enough safeguards to make me feel comfortable about personal information.	Cheng et al. (2018); McKnight et al. (2002); Parasuraman et al. (2005)
RH-LPT2	The company makes it safe for me to conduct online transactions there.	Cheng et al. (2018)
RH-LPT3	The legal structures adequately protect me from problems with the company.	Cheng et al. (2018)
RH-LPT4	The company provides reliable opinions and ratings about drivers or passengers.	Adapted from Bapna et al. (2017)
RH-CON1	I can access to the customer assistance by different channels (online, by email, by a voice call)	Adapted from Parasuraman et al. (1985)
RH-CON2	The app/website provides contacts to easily reach the customer assistance (number, e-mail or others)	Adapted from Parasuraman et al. (1985)
RH-CON3	The waiting time for receiving assistance is adequate	Adapted from Parasuraman et al. (1985)
RH-ECO1	For the given price, I rate the service offer as good.	Fornell et al., 1996; Lamberton and Rose, 2012
RH-ECO2	For the given quality of the service offer, I rate the price as good.	Fornell et al., 1996; Lamberton and Rose, 2013
RH-ECO3	The company offers more affordable prices than traditional transportation services	Benoit (2017); Tussyadiah, I. P., & Pesonen, J. (2016).
RH-TAN1	The car is comfortable.	Adapted from Ju et al. (2019)
RH-TAN2	The car is visually appealing.	Adapted from Ju et al. (2019)
RH-TAN3	The car is clean.	Adapted from Ju et al. (2019)
RH-PSP1	The driver is competent at serving their customers.	Adapted from McKnight et al. (2002)
RH-PSP2	I can rely on drivers to finish the part of riding.	Adapted from McKnight et al. (2002)
RH-PSP3	The driver is good at what he/she does.	Adapted from McKnight et al. (2002)
RH-PSP4	I always feel comfortable relying on drivers to arrive at my destination.	Adapted from McKnight et al. (2002)
RH-EMP1	The driver acts in a customers' best interest.	Adapted from McKnight et al. (2002)
RH-EMP2	If a customer requires help, the driver does the best to help	Adapted from McKnight et al. (2002)
RH-EMP3	The driver is interested in customer well-being, not just his/her own well-being.	Adapted from McKnight et al. (2002)

Appendix 2: Source from the past literature of the items included in the RS-scale proposal

Code	Items	Source
RH-SOR1	The information of app/website is well organized.	Parasuraman et al. (2005)
RH-SOR2	The app/website is easy to use.	Parasuraman et al. (2005)
RH-SOR3	The app/website makes it easy to find what I need.	Parasuraman et al. (2005); Cheng et al. (2018)
RH-SOR4	The app/website makes it easy for me to conclude my transaction.	Möhlmann (2015)
RH-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.	Adapted from Cheng et al. (2018)
RH-PRA2	The company takes care of problems promptly	Parasuraman et al. (2005)
RH-PRA3	The company offers fair compensation for its mistakes.	Ganguli and Roy (2010); Parasuraman et al. (2005)
RH-LPT1	The company provides enough safeguards to make me feel comfortable about personal information.	Cheng et al. (2018); McKnight et al. (2002); Parasuraman et al. (2005)
RH-LPT2	The company makes it safe for me to conduct online transactions there.	Cheng et al. (2018)
RH-LPT3	The legal structures adequately protect me from problems with the company.	Cheng et al. (2018)
RH-LPT4	The company provides reliable opinions and ratings about drivers or passengers.	Adapted from Bapna et al. (2017)
RH-CON1	I can access to the customer assistance by different channels (online, by email, by a voice call)	Adapted from Parasuraman et al. (1985)
RH-CON2	The app/website provides contacts to easily reach the customer assistance (number, e-mail or others)	Adapted from Parasuraman et al. (1985)
RH-CON3	The waiting time for receiving assistance is adequate	Adapted from Parasuraman et al. (1985)
RH-ECO1	For the given price, I rate the service offer as good.	Fornell et al., 1996; Lamberton and Rose, 2012
RH-ECO2	For the given quality of the service offer, I rate the price as good.	Fornell et al., 1996; Lamberton and Rose, 2013
RH-ECO3	The company offers more affordable prices than traditional transportation services	Benoit (2017); Tussyadiah, I. P., & Pesonen, J. (2016).
RH-TAN1	The car is comfortable.	Adapted from Ju et al. (2019)
RH-TAN2	The car is visually appealing.	Adapted from Ju et al. (2019)
RH-TAN3	The car is clean.	Adapted from Ju et al. (2019)
RH-PSP1	The driver is competent at serving their customers.	Adapted from McKnight et al. (2002)
RH-PSP2	I can rely on drivers to finish the part of riding.	Adapted from McKnight et al. (2002)
RH-PSP3	The driver is good at what he/she does.	Adapted from McKnight et al. (2002)
RH-PSP4	I always feel comfortable relying on drivers to arrive at my destination.	Adapted from McKnight et al. (2002)
RH-EMP1	The driver acts in a customers' best interest.	Adapted from McKnight et al. (2002)
RH-EMP2	If a customer requires help, the driver does the best to help	Adapted from McKnight et al. (2002)
RH-EMP3	The driver is interested in customer well-being, not just his/her own well-being.	Adapted from McKnight et al. (2002)
RS-SI1	The use of the service allows me to develop social relationships.	Tussyadiah & Pesonen (2016)
RS-SI2	I enjoy myself sharing a ride with new people.	Own proposal
RS-SI3	I usually find a friendly environmental when I shared a ride.	Own proposal
RS-SI4	I feel safe sharing a ride with other people I don't know using the service.	Own proposal

Appendix 3: Source from the past literature of the items included in the CS-survey proposal

Code	Items	
CS-SOR1	The information of app/website is well organized.	Parasuraman et al. (2005)
CS-SOR2	The app/website is easy to use.	Parasuraman et al. (2005)
CS-SOR3	The app/website makes it easy to find what I need.	Parasuraman et al. (2005); Cheng et al. (2018)
CS-SOR4	The app/website makes it easy for me to conclude my transaction.	Möhlmann (2015)
CS-SOR5	The app/website allows to easily report the car-damages.	Own proposal
CS-SOR6	The app/website allows me to easily reach the precise location of a car I would like to rent.	Own proposal
CS-PRA1	The company promptly responds to my requests and questions which I made by e-mail or other channels.	Adapted from Cheng et al. (2018)
CS-PRA2	The company takes care of problems promptly	Parasuraman et al. (2005)
CS-PRA3	The company offers fair compensation for its mistakes.	Ganguli and Roy (2010); Parasuraman et al. (2005)
CS-LPT1	The company provides enough safeguards to make me feel comfortable about personal information.	Cheng et al. (2018); McKnight et al. (2002); Parasuraman et al. (2005)
CS-LPT2	The company makes it safe for me to conduct online transactions there.	Cheng et al. (2018)
CS-LPT3	The legal structures adequately protect me from problems with the company.	Cheng et al. (2018)
CS-LPT4	The terms of the insurance coverage provided are clear and easy to understand.	Own proposal
CS-C1	I can access to the customer assistance by different channels (online, by email, by a voice call)	Adapted from Parasuraman et al. (1985)
CS-C2	The app/website provides contacts to easly reach the customer assistance	Adapted from Parasuraman et al. (1985)
CS-C3	The waiting time for receiving assistance is adequate	Adapted from Parasuraman et al. (1985)
CS-TAN1	The car is comfortable.	Adapted from Ju et al. (2019)
CS-TAN2	The car is visually appealing.	Adapted from Ju et al. (2019)
CS-TAN3	The car is clean.	Adapted from Ju et al. (2019)
CS-TAN4	The technological equipment installed on the car allows to start and to end the rental easily.	Own proposal
CS-ECO1	For the given price, I rate the [TS] offer as good.	Fornell et al., 1996; Lamberton and Rose, 2012
CS-ECO2	For the given quality of the [TS] offer, I rate the price as good.	Fornell et al., 1996; Lamberton and Rose, 2013
CS-ECO3	The TS offers more affordable prices than traditional transportation services	Benoit (2017); Tussyadiah, I. P., & Pesonen, J. (2016).

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