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Carsharing for sustainable urban mobility: enabling factors and challenges. A multiple-case study of Italian operators

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ABSTRACT

Carsharing is a shared mobility service within the range of solutions advancing sustainability in urban mobility, which, especially in Italy, is undermined by the dominance of private mobility. However, after years of growth, the carsharing sector has suffered a major setback, raising uncertainty about what the potential contribution of these services to the sustainable development of urban mobility currently is, what elements of the business model and external factors enable the creation and delivery of value to customers and what are the challenges that are possibly causing the stagnation. This exploratory research involves multiple case studies of Italian carsharing operators in the B2C segment – *Enjoy, Share Now, Drivalia, Corrente, E-Vai* – integrated with a sample of stakeholders involved in the sector – *Osservatorio Nazionale Sharing Mobility, Roma Mobilità* – to understand whether, at present, these services can effectively support the sustainable development of urban mobility in Italy. Qualitative data were collected through semi-structured interviews and then analyzed using the thematic analysis method. Key findings are: (1) Carsharing operators potentially contribute to four Sustainable Development Goals - 8, 10, 11, and 13 - through six specific targets, with the magnitude of their contributions varying based on operating models and specific business characteristics. (2) Value is created mainly through agreements, flexible car sourcing, business model innovation and exploitation of synergies, and delivered through wide-ranging rental options, customer rewarding mechanisms, and strategic parking lots. Italian operators also benefit from the emergence of a new market segment demanding for longer rentals, the development of Mobility-as-a-Service and innovations in adjacent sectors – Automotive and Energy. (3) Operators' economic equilibrium is severely undermined by business and operations' management difficulties, consumer dissatisfaction with mobile apps and pricing, limited charging infrastructure, contingent international crises (i.e. Covid-19, Ukrainian war), rise of micromobility and obstructive local administrations' policies, limiting opportunities for re-investment in business growth and service improvement.

For carsharing to realize its full potential and integrate effectively into the sustainable mobility "ecosystem", it necessitates a supportive regulatory framework and intervention through public policy.

Table of contents

INTRODUCTION	1
1. LITERATURE REVIEW	4
1.1 The transition from ownership to Sharing Economy	4
1.2 Sustainable Development	5
1.2.1 <i>Sustainable Development Goals</i>	<i>6</i>
1.3 Sustainable Business Models	7
1.3.1 <i>Business modeling: Business Model Canvas</i>	<i>8</i>
1.3.2 <i>Product-Service System</i>	<i>11</i>
1.3.3 <i>Convergence of SE and PSS</i>	<i>12</i>
1.4 Carsharing: a Shared-based Product-Service System	14
1.4.1 <i>Economic model of carsharing</i>	<i>15</i>
1.4.2 <i>Operating model of carsharing</i>	<i>16</i>
1.4.3 <i>A focus on station-based and free-floating carsharing configurations</i>	<i>17</i>
1.4.4 <i>Car ownership reduction</i>	<i>18</i>
1.5 Research gaps.....	19
2. METHODOLOGY	20
2.1 Research strategy.....	20
2.2 Research design.....	20
2.3 Research method.....	21
2.3.1 <i>Primary data collection</i>	<i>21</i>
2.3.2 <i>Secondary data collection.....</i>	<i>22</i>
2.3.3 <i>Interview guideline</i>	<i>22</i>
2.4 Sampling.....	23
2.5 Data analysis	24
2.6 Research quality.....	25
3. INDUSTRY OVERVIEW.....	27
3.1 Overview of the Italian car market	27
3.2 Analysis of the Italian carsharing market	29
3.2.1 <i>Key figures and interpretations</i>	<i>30</i>
3.2.2 <i>The role of local administrations.....</i>	<i>36</i>
4. EVIDENCE FROM MULTIPLE CASES.....	39
4.1 Enjoy	39
4.1.1 <i>Potential contribution to SDGs.....</i>	<i>40</i>
4.1.2 <i>Enabling value creation and delivery elements and external factors</i>	<i>41</i>
4.1.3 <i>Challenges in value capture dynamics</i>	<i>42</i>
4.2 Share Now	43
4.2.1 <i>Potential contribution to SDGs.....</i>	<i>44</i>

4.2.2	<i>Enabling value creation and delivery elements and external factors</i>	45
4.2.3	<i>Challenges in value capture dynamics</i>	47
4.3	e-Go! Drivalia	47
4.3.1	<i>Potential contribution to SDGs</i>	48
4.3.2	<i>Enabling value creation and delivery elements and external factors</i>	49
4.3.3	<i>Challenges in value capture dynamics</i>	50
4.4	Corrente: “Il carsharing che ti carica”	51
4.4.1	<i>Potential contribution to SDGs</i>	52
4.4.2	<i>Enabling value creation and delivery elements and external factors</i>	53
4.4.3	<i>Challenges in value capture dynamics</i>	55
4.5	E-Vai: “Il carsharing fuori dal comune”	55
4.5.1	<i>Potential contribution to SDGs</i>	56
4.5.2	<i>Enabling value creation and delivery elements and external factors</i>	58
4.5.3	<i>Challenges in value capture dynamics</i>	59
4.6	Osservatorio Nazionale Sharing Mobility	59
4.6.1	<i>Potential contribution of carsharing to SDGs and grounding pre-conditions</i>	60
5.	KEY FINDINGS AND ANSWERS TO RESEARCH QUESTIONS	62
5.1	Potential contribution of Italian carsharing operators to SDGs	63
5.1.1	<i>Context-independent SDG targets</i>	64
5.1.2	<i>Context-specific SDG targets</i>	67
5.2	Enabling business model elements and external factors	69
5.2.1	<i>Value creation elements</i>	70
5.2.2	<i>Value delivery elements</i>	71
5.2.3	<i>Positive external factors</i>	73
5.3	Challenges in value capture dynamics	75
5.3.1	<i>Difficulties in business and operations’ management</i>	76
5.3.2	<i>Consumer-related issues</i>	77
5.3.3	<i>Infrastructural constraints and contingent factors</i>	79
5.3.4	<i>Obstructive local administrations’ policies</i>	80
CONCLUSIONS		84
	<i>Implications</i>	86
	<i>Research limitations</i>	86
	<i>Future research</i>	87
BIBLIOGRAPHY		88
APPENDIX		93
THESIS SUMMARY		I

INTRODUCTION

United Nations forecast an increase in people concentration within cities from 56% in 2021 to 68% in 2050¹, raising population density in urban areas that are increasingly qualifying as environments where people work, move and where life is regulated by streets' viability. Therefore, to meet the travel needs of a growing number of people concentrated in large urban centers and effectively tackle the ever-growing problem of congestion caused by moving and parked private cars – that typically remain idle for 95% of their useful lifespan² –, urban mobility is expected to undergo profound changes in the next decade. First, traffic congestion resembles an economic problem, in terms of consumption of resources that cannot be replenished. Second, it is an environmental problem, because it generates negative effects in terms of pollutant emissions with repercussions on the health of the planet and the population. Third, it is a social problem because it seriously affects the quality of life and safety of citizens. Offering a solid alternative to private mobility is key to reduce the negative effects of traffic congestion.

The sustainable development of urban mobility is becoming one of the major topics of debate in local, national and international policies, unlocking new areas for business investment and innovation. Moreover, advancing sustainability in the mobility sector is definitely an opportunity to make progress towards the higher Sustainable Development Goals (SDGs) set by the United Nations in the Agenda 2030 to address the challenge of sustainability in its environmental, social and economic dimensions³.

In this context, new business models have emerged, enabled by Sharing Economy and digitization. Among these, carsharing models offer a mobility service that, by grafting among all those solutions involving the shared use of a mobility asset, falls within the broader range of solutions to replace private mobility. In literature, carsharing is associated with the Shared-based Product-Service System (SPSS)⁴, a peculiar business model that integrates product with service to collectively meet customers' demands, thereby promoting efficiency in utilization.

In Italy, however, the carsharing sector has suffered a major setback after years of growth, raising uncertainty about what the potential contribution of these services to the sustainable development of urban mobility currently is, what elements of the business model and external factors enable the creation and delivery of value and what are the unsolved challenges that possibly caused the stagnation.

While there are some quantitative studies aiming to establish a correlation between carsharing and car ownership reduction in Italy, addressing the specific issue of traffic congestion, there is scarcity of comprehensive and extensive qualitative studies that explore the broader contribution of carsharing to the

¹ United Nations, Department of Economic and Social Affairs, Population Division (2019). World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420). New York: United Nations

² Shoup, D.C. (2017). The high cost of free parking, updated Routledge

³ United Nations (2020). About the Sustainable Development Goals. Available online: [Link](#)

⁴ Somers, L., Dewit, I., & Baelus, C. (2018). Understanding product-service systems in a sharing economy context – A literature review. *Procedia CIRP*, 73, 173–178. <https://doi.org/10.1016/j.procir.2018.03.317>

sustainable development of urban mobility as measured by the SDGs. Furthermore, academic research lacks rigorous examinations of the underlying dynamics of value creation, delivery and capture within carsharing business models, as well as the current challenges faced by the stagnating carsharing sector in Italy.

Therefore, the purpose of this research is to fill the identified gaps by conducting a thorough qualitative analysis through multiple-case interviews with existing and established Italian carsharing operators in the B2C segment – *Enjoy, Share Now, Drivalia, Corrente, E-Vai* – and key industry stakeholders – *Osservatorio Nazionale Sharing Mobility, Agenzia Roma Servizi per la mobilità*. By investigating operators' potential contribution to the SDGs, the underlying value dynamics of their business models and the current challenges they are facing, the ultimate goal is to determine whether carsharing, at its current state, can effectively support the sustainable development of urban mobility in Italy.

Based on this, the author has developed the following research question:

RQ: *Can B2C carsharing operators effectively support the sustainable development of urban mobility in Italy?*

To provide a comprehensive answer to the main research question, the researcher has developed the following sub-questions:

SQ1: *What Sustainable Development Goals do Italian carsharing operators potentially contribute to?*

SQ2: *What are the key business model elements and external factors that support Italian carsharing operators in creating and delivering value?*

SQ3: *What are the challenges currently hindering the value capture dynamics of Italian carsharing operators?*

The author aims to make a valuable contribution to academic research by combining relevant academic literature with elaborations on primary data obtained through multiple-case interviews. The author has employed thematic analysis to make sense of primary data gathered from interviews and build a thematic framework.

This research seeks to establish practical connections between the theoretical concepts of SPSS and sustainable development, specifically by linking carsharing to the SDGs, while offering “actionable” insights to carsharing operators and stakeholders in Italy by highlighting areas for improvement.

The research is structured in five main sections: literature review, methodology, industry overview, evidence from multiple cases and key findings.

The literature review follows a funnel approach. It begins by explaining the transition from ownership to Sharing Economy and discusses the theory of Product-Service Systems, Business modeling and Sustainable Development, narrowing down to carsharing business models and Sustainable Development Goals. The identified research gaps are then outlined at the end of the chapter.

The methodology presents and explains the choices concerning the nature and structure of this research and the different techniques and methods used to collect both primary and secondary data.

The industry overview provides a contextual analysis of mobility in Italy by examining the current state of the private car market and the industry of carsharing, discussing sector's dynamics and major trends emerging from secondary and primary data analysis.

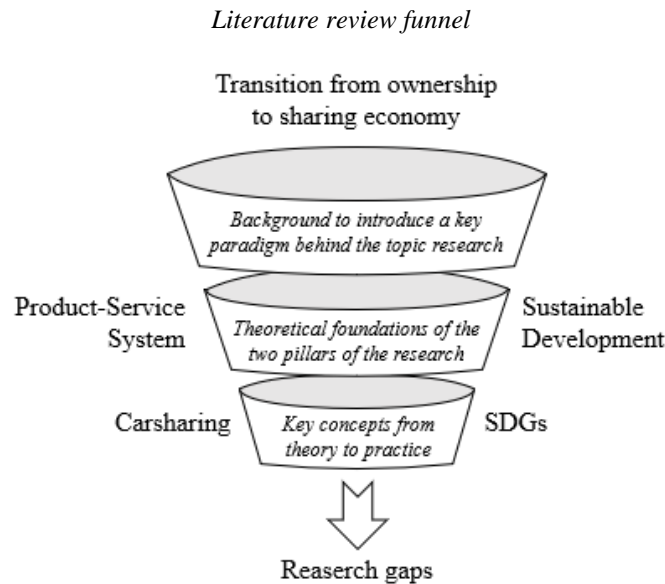
The evidence from multiple cases includes a summary of the key findings from the semi-structured interviews organized by company.

The key findings chapter is organized into three sections reflecting the aggregate dimensions of the thematic framework in which the first- and second-order concepts have been thoroughly analyzed and further expanded, ultimately answering the three sub-research questions.

The concluding section provides the answer to the main research question. In addition, the potential implications of this research, research limitations and future research proposals are discussed at the end of the chapter.

1. LITERATURE REVIEW

This literature review constitutes the theoretical and conceptual foundation of the thesis, establishing the current state of academic knowledge and understanding around sustainable business models and sustainable development. It begins with a general overview and then gradually narrows down to specific concepts related to carsharing and its relationship with sustainable urban mobility and concludes with the identification of research gaps (see figure below).



Source: Personal elaboration

1.1 The transition from ownership to Sharing Economy

The Sharing Economy (SE) is rapidly gaining momentum as part of this larger trend of moving away from an emphasis on owning things towards sharing them. It appears that there is a lack of well-defined, clear and consistent definitions for SE in the academic literature, making it difficult to understand exactly what it encompasses⁵. A wide-accepted view refers to SE as a social and economic transactional system in which companies use technology platforms to match providers and users to exchange goods, services, or ideas without transferring ownership⁶. In fact, SE can be considered as an economic paradigm that incorporates granting access to underutilized resources. Ownership retention goes along with the distinction between ownership and usership, i.e., the user and the owner of a product do not have to be the same person, and entails a temporal dimension, meaning that ownership and usership can be traded and occur sequentially⁷. Building upon the previous claims, SE grounds its roots on three main drivers⁸. First, there has been a

⁵ Netter, S., Pedersen, E. R. G., & Lüdeke-Freund, F. (2019). Sharing Economy Revisited: Towards a New Framework for Understanding Sharing Models. *Journal of Cleaner Production*, 221, 224-233. <https://doi.org/10.1016/j.jclepro.2019.02.225>

⁶ Eckhardt, G. M., Houston, M. B., Jiang, B., Lamberton, C., Rindfleisch, A., & Zervas, G. (2019). Marketing in the sharing economy. *Journal of Marketing*, 83(5), 5-27.

⁷ Netter, S., Pedersen, E. R. G., & Lüdeke-Freund, F. (2019)

⁸ Sundararajan, Arjun (2017), *The Sharing Economy: The End of Employment and the Rise of Crowd-Based Capitalism*, Cambridge, MA, USA and London, UK: MIT Press.

change in consumer behavior, with more people opting for temporary usage rather than ownership. Second, electronic market platforms and social networks have made it easier for people to connect and share goods with one another. Third, mobile devices and electronic services have given rise to the "app economy," which enables on-the-go services through smart devices⁹.

The rise of digital technologies has facilitated the transformation of the product economy into a service economy. This shift offers a unique opportunity for sustainable growth, benefiting not only businesses but also the environment. The process of "servitization", whereby digital technologies can convert products into services, has made this transition more accessible to small and medium-sized enterprises (SMEs), not just large corporations. To fully embrace this change, a shift in mindset is required. Consumers must place more importance on accessing goods rather than owning them, while companies must harness the power of digital technologies to create efficient and sustainable businesses. By doing so, individuals, businesses, and the environment may benefit from this transformation.

In general, the use of information and communication technologies (ICT) have made it easier and more cost-effective for users and producers to connect and exchange goods and services through digital platforms. This has paved the road to new opportunities for different forms of exchanges and solutions¹⁰. In fact, such transformation not only brings economic benefits but is able to address higher environmental and social benefits as the consumption of resources is decreased, the use of renewable and environmentally friendly resources is favored, and the use of goods is intensified.

1.2 Sustainable Development

One of the pillars of the research is "Sustainable Development", which has become an increasingly important topic in recent years as the world faces the urgent need to address the ongoing climate crisis. The term "Sustainable Development" first appeared in the Brundtland Report presented in 1987 as "*a development that meets the needs of the present without compromising the ability of future generations to meet their own needs*"¹¹.

The report's definition of sustainable development offers valuable insights but has limitations. It conflates needs with wants, assumes economic growth is essential, and neglects to explicitly mention the natural environment. However, it indirectly recognizes the importance of preserving the environment to meet human needs.

⁹ Daglis, T. (2022). Sharing Economy. Encyclopedia, 2, 1322–1332. <https://doi.org/10.3390/encyclopedia2030088>

¹⁰ Geissinger, A., Laurell, C., Öberg, C., & Sandström, C. (2019). How sustainable is the sharing economy? On the sustainability connotations of sharing economy platforms. *Journal of Cleaner Production*, 206, 419–429. <https://doi.org/10.1016/j.jclepro.2018.09.196>

¹¹ Brundtland, G. H. (1987). Our common future—Call for action. *Environmental conservation*, 14(4), 291-294.

In response to these limitations, Mark Diesendorf, in his work "Sustainability and Sustainable Development", redefined the concept as "sustainable development [that] comprises types of economic and social development which protect and enhance the natural environment and social equity"¹².

This revised definition emphasizes the three fundamental aspects of sustainable development: environmental, social, and economic. It also underscores that the ecological aspect and social equity are primary. It makes clear that sustainable development is not solely about economic growth but also about protecting the natural environment and ensuring social equity.

Environmental sustainability is centered on preserving the essential functions of the environment, such as resource provision and protection of its integrity, for the long-term. On the other hand, social sustainability ensures equal conditions of well-being, security, and health for people across the globe. Finally, economic sustainability involves the effective use of resources to generate work and income, while also enhancing the unique features of products and services at a local level.

The Diesendorf's definition represents a shift away from measuring corporate performance solely on financial results and towards a more integrated approach to sustainability that goes beyond the environment.

1.2.1 Sustainable Development Goals

The growing attention to sustainability is gradually attracting the interest of most countries, businesses and individuals even with global maneuvers aimed at promoting it. In 2015 the 2030 Agenda for Sustainable Development was approved by the 193 constituent countries of the United Nations, where 17 Sustainable Development Goals (SDGs) were broken down into 169 targets and 240 indicators to be achieved by 2030¹³.

The 17 Sustainable Development Goals



Source: sdgs.un.org

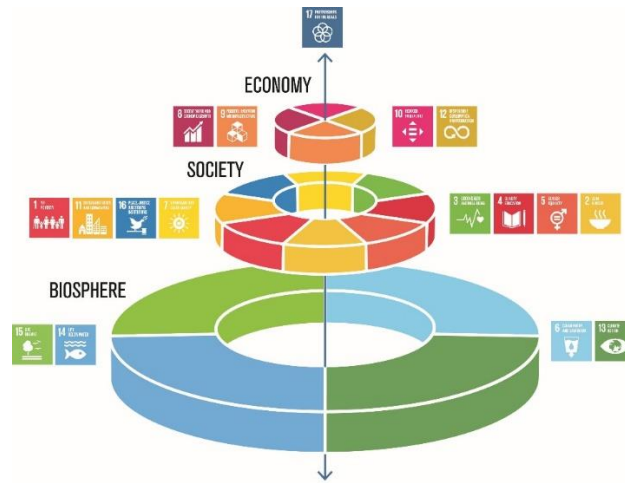
The 2030 Agenda represents a decisive response to the need for integrated action to address the challenge of sustainability in its economic, social, and ecological dimensions. The Stockholm Resilience Centre (SRC) has categorized the 17 SDGs into three dimensions: economic, social, and environmental (see figure below). In this way, the SRC provided a framework that allows for a more comprehensive and nuanced

¹² Diesendorf, M., (2000). 'Sustainability and sustainable development', in Dunphy, D, Benveniste, J, Griffiths, A and Sutton, P (eds) Sustainability: The corporate challenge of the 21st century, Sydney: Allen & Unwin, chap. 2, 19-37.

¹³ United Nations (2020)

understanding of sustainable development, highlighting the interconnectedness between the three dimensions and emphasizing that progress in one dimension cannot come at the expense of another.

Sustainable Development Goals by dimensions



Source: SRC (2017), Available online: [Link](#)

The SDGs serve as a blueprint for achieving a better and more sustainable future for all by addressing global challenges such as poverty, inequality, climate change, environmental degradation, and peace and justice. In one word, long-term prosperity.

Although the SDGs are primarily seen as objectives for governments and states, companies also play a crucial role in their accomplishment¹⁴. In fact, the SDGs can guide companies in making investments and identifying opportunities¹⁵.

Sustainability has become one of the fundamental pillars of corporate growth shifting towards sustainable strategies that generate value while minimizing negative impacts on the environment and society. Therefore, sustainable development suggests that in addition to economic goals, businesses should also aim to achieve environmental and social targets, while maintaining their competitiveness in the market¹⁶. Business model innovation is thus suggested as a key approach to sustainable development. By embracing business model innovation, businesses can create new products and services that address environmental and social challenges while still maintaining their competitive edge. This can ultimately lead to sustainable development, where economic growth is achieved without negatively impacting the environment or society.

1.3 Sustainable Business Models

There is a current debate among academics and business managers about whether Sustainable Business Models (SBMs) will replace traditional ones in the future. However, it is widely agreed upon that SBMs

¹⁴ Rosati, F.; Faria, L.G.D., (2019). Addressing the SDGs in sustainability reports: The relationship with institutional factors. *J. Clean. Prod.* 215, 1312–1326.

¹⁵ Pedersen, C.S. (2018). The UN Sustainable Development Goals (SDGs) are a Great Gift to Business! *Procedia CIRP*, 69, 21–24.

¹⁶ Barquet, A. P. B., Seidel, J., Seliger, G., & Kohl, H. (2016). Sustainability Factors for PSS Business Models. *Procedia CIRP*, 47, 436–441. <https://doi.org/10.1016/j.procir.2016.03.021>

are an extension and revision of conventional business models and provide a competitive advantage to organizations by enabling them to pursue sustainable goals and targets, e.g. SDGs, while maintaining productivity and profitability.

Moreover, the ultimate goal of SBMs is to create value for the triple bottom line, encompassing environmental, social, and economic factors¹⁷. Such models employ proactive multi-stakeholder management, innovation, and a long-term perspective to achieve sustainability goals and have proved effectiveness in reducing the harmful effects of business activities on the environment and society¹⁸.

1.3.1 Business modeling: Business Model Canvas

The research findings are based on the analysis of business models, underlining the necessity of initially defining what a business model entails. An organization creates, delivers, and captures value, with "value" being interpreted in several ways¹⁹, which forms the basis for defining a business model: "*...a business model represents the underlying logic and strategic choices made by a business to generate and capture value within a network*"²⁰. It plays a fundamental role in visualizing, understanding and communicating the core principles of how the business operates. Every business, whether explicitly or implicitly, operates based on a particular business model that outlines the design and framework for value creation, delivery, and capture. The capture of value refers to the business aspects that enable the return of the value initially created and delivered to customers. The essence of a business model lies in defining how the enterprise provides value to customers, attracts their willingness to pay for that value and ultimately converts those payments into profit.

A widely recognized business modeling tool is the Business Model Canvas (BMC) by Osterwalder and Pigneur²¹, represented below in a revised version that will be utilized in the upcoming analysis:

¹⁷ Dyllick, T.; Hockerts, K. (2002) Beyond the business case for corporate sustainability. *Bus. Strategy Environ.* 11, 130–141

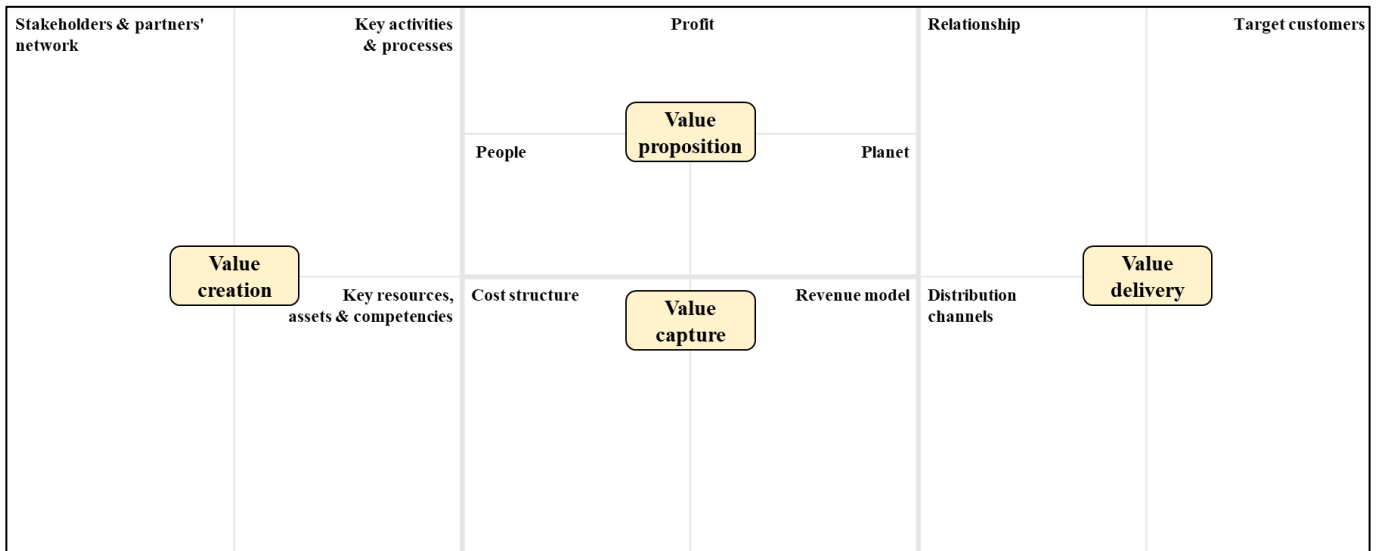
¹⁸ Charles, O.H., Jr.; Schmidheiny, S.; Watts, P., (2017). *Walking the Talk: The Business Case for Sustainable Development*; Routledge: Abingdon, UK,

¹⁹ Osterwalder, A., Pigneur, Y. (2010). *Business Model Generation*. Hoboken: John Wiley & Sons;

²⁰ Shafer, S. M., Smith, H. J., & Linder, J. C. (2005). The power of business models. *Business horizons*

²¹ Osterwalder, A. and Pigneur, Y. (2010)

Revisited Business Model Canvas



Source: Personal elaboration

The BMC consists of nine blocks, the so-called "Building Blocks," which are the building blocks of a company. The three blocks on the right side of the framework are associated with external "processes": target customers, distribution channels and customer relationships. The three blocks on the left side, on the other hand, are associated with internal processes and efficiency: resources, assets and competencies, activities and processes, stakeholders and partners' network. The authors of the model state that the right side of the framework concerns value, while the left side concerns efficiency. The value proposition is in the middle, and cost and revenue structures are presented in the lower part of the model as the value capture part. Any changes made to one block also have repercussions for all the others. The nine blocks are:

- *Target customers*: the company tries to answer some specific questions, "For whom are we creating value?", "Who are our most important customers?" In other words, the company describes one or more consumer segments to which its offerings are targeted. Consumer segments can be defined through one or more factors, which can be demographic, psychographic, behavioral, or based on purchase context. For companies that want to effectively segment a market, it is often best to develop a deep understanding of customer needs early on.
- *Value Proposition*: the company must answer the following questions, "What value do we bring to economy, people and planet?", "What is our offering substantiated in?". The block expresses the value proposition of the company, understood as a promise the company makes to the segment it is targeting.
- *Distribution channels*: the company answers the following questions, "Through which channels do we reach the target segment?". The means through which the company contacts customers with its value proposition are identified. The block devoted to channels is defined as "the way a company

communicates and reaches out to its customer segment to present its value proposition"²². They represent "touch points" for the consumer, they are highly relevant in the overall consumer experience.

- *Customer Relationships*: the main questions for the company to ask in this section is, "What kind of relationships does the company expect to establish and maintain with customers?", "How are they integrated into the business model?". Interacting with and questioning the interaction with the target audience helps explain what kind of relationship is being established, support the consumer experience, and strengthen the company's profile in the marketplace.
- *Stakeholders and partners' network*: frequently asked questions for an enterprise regarding this building block are "What are the key corporate partners?", "What are the key stakeholders?", "What key resources and activities come from these?". The basic assumption that justifies the existence of such a block is that often a company, especially at the beginning of its life cycle, does not have all the resources and internal activities necessary to deliver the promised value to customers in full autonomy. In addition, the operation of the business, in some cases, cannot disregard the relationship with certain key stakeholders.
- *Key resources, assets and competencies*: In this block, the key question the company should ask itself is, "What are the key resources, assets and competencies needed to deliver on the value proposition?". Resources, assets and internal competencies are essential elements in ensuring sustainable competitiveness, needed to create, communicate and distribute the value proposition, that is, to make the business work.
- *Key activities and processes*: "What key activities and processes are required to maintain the value proposition offered?" is the main question the company asks in this block. They are defined as the set of operations and processes that underlie the value creation of the enterprise. Similar to the previous block, activities are required to create, communicate and deliver the company's value proposition and clearly differ depending on the business model being considered.
- *Cost structure*: the questions for the company in this building block are, "What are the most relevant costs in the business model?", "What are the most expensive key resources and activities?". Building blocks related to resources, activities and partners do not generate revenue, but rather bring value to the consumer and generate costs, variable or fixed, for the company. Once the costs are calculated, they are included in the cost structure that encapsulates all of the expenditures the company must incur to move the business forward. The actions of creating and distributing value as well as maintaining customer relationships all involve costs.

²² Ibid

- *Revenue model*: Regarding the latter block, the questions a business asks are, "For what value are customers actually willing to pay?", "For what and in what ways do they actually pay?", "To what extent does each revenue stream contribute to total revenues?". The value proposition, customer segment, channels and customer relationships all contemplate the creation and delivery of value to the customer. Given that the goal of businesses is to make a profit, they must generate revenues that at least cover their costs. In the BMC this is conceptualized in the building block related to inflows, which represent the revenue generated by the company in each customer segment including pricing strategies.

However, while the BMC take an economic viewpoint, other authors such as Lüdeke-Freund and Bocken et al., have expanded on this by incorporating environmental and social sustainability dimensions.

1.3.2 *Product-Service System*

Bocken et. al. identified eight archetypes of sustainable business models, with one archetype being "Deliver functionality rather than ownership." This archetype is essentially based on the literature of the "Product-Service System" (PSS). Implementing a PSS-based business model can yield sustainability benefits such as breaking the link between profit and production volume, reducing resource consumption, motivating and enabling responsible product ownership by the manufacturer, enhancing efficiency in product use, increasing product longevity and durability, and increasing the amount of materials reused²³.

The most cited definition of PSS, provided by Tukker (2004), suggests that product-services are a combination of material goods and intangible services created and blended to satisfy the needs of the client. A network, infrastructure, and governance structures are all components of the system needed to deliver a product-service. This concept is inclusive and acknowledges that pure products and pure services can have various potential. Product-services can be more product- or service-oriented, but they will always be linked to the other components of the system²⁴.

Such shift from selling products to offering value propositions based on PSS results in the development of PSS-based business models where companies often offer services in addition to products or take over the operation of the products instead of selling them²⁵. In this way, PSSs are key for executing a servitization strategy by integrating products and services for value-in-use. In fact, it is the product's function that creates

²³ Bocken, N.M.P., et.al. (2014). A literature and practice review to develop sustainable business model archetypes. In: *Journal of Cleaner Production*. 65, p. 42-56

²⁴ Tukker, A, and U Tischner. (2006). *New Business for Old Europe: Product-Service Development, Competitiveness and Sustainability*. 1. Taylor & Francis Group.

²⁵ Blüher, T., Riedelsheimer, T., Gogineni, S., Klemichen, A., & Stark, R. (2020). Systematic Literature Review—Effects of PSS on Sustainability Based on Use Case Assessments. *Sustainability*, 12(17), 6989. <https://doi.org/10.3390/su12176989>

value rather than the product itself²⁶. The offered value depends on the configuration of the PSS²⁷ that provide consumers with different kind of services:

- Product-oriented services, where products are enhanced by related services such as maintenance or insurance contracts.
- Result-oriented services, where the delivery of pre-determined results is the key part of the provider's value proposition. The provider decides freely how to deliver these results.
- Use-oriented services, a hybrid of the previous two configurations, create value through leasing, renting, or sharing instead of selling products, with accessibility as the key factor; the PSS provider retains product ownership in this scenario.

All three types of PSSs fulfill customer needs by combining products and services. However, the potential benefits for social and environmental sustainability vary across the various categories of product-service systems. When it comes to environmental sustainability in product-oriented services, the only possible outcome might be better maintenance. Moreover, the business incentive for companies offering product-oriented PSS remains to sell as many products as possible. Instead, result-oriented PSS have the potential for sustainability benefits, as material resources are only a cost factor for the provider and more products produced do not lead to increased revenue²⁸. Finally, in use-oriented PSS there is an opportunity to increase resource usage and extend product availability to those individuals who cannot afford to own it, thus consolidating a benefit in terms of social sustainability.

1.3.3 Convergence of SE and PSS

Recent studies have investigated the convergence of PSS and SE to find out how these concepts complement and enhance each other. Blurring the distinction between products and services, SE pairs with PSS²⁹ enabling a new model: the Shared-based PSS (SPSS)³⁰.

The SPSS is regarded as a sustainable PSS model that offers a combination of products and services that collectively meet a particular customer's demand. This is achieved through innovative interactions among stakeholders within the sharing system. The providers involved in the system continuously strive to seek

²⁶ Tukker, A. (2015). Product services for a resource-efficient and circular economy—A review. *Journal of Cleaner Production*, 97(15), 76–91

²⁷ Abdelkafi, N., Pero, M., Masi, A., & Capurso, I. (2022). Revisiting the servitization-sustainability link: A case study in the professional printing supply chain. *Cleaner Logistics and Supply Chain*, 4, 100061. <https://doi.org/10.1016/j.clsen.2022.100061>

²⁸ Tukker, A. (2004). Eight types of product-service system: eight ways to sustainability? In: *Experiences from SusProNet. Business Strategy and the Environment*, 13/4; p. 246-260

²⁹ Somers, L., Dewit, I., & Baelus, C. (2018)

³⁰ Li, D., Huang, Y., Sun, H., & Zhi, B. (2021). Achieving sustainability in sharing-based product service system: A contingency perspective. *Journal of Cleaner Production*, 332, 129997. <https://doi.org/10.1016/j.jclepro.2021.129997>

solutions that are both environmentally and socio-ethically beneficial, reflecting their economic and competitive interests³¹.

A SPSS involves matchmaking services for users to access products and services for a short-term period in exchange for access fees, while the provider retains ownership of the product and is responsible for maintenance, repair, and control³². With such premises, the use-oriented configuration of PSS align with and enable the features of the SE³³, as users get benefits from the product and service at the same time.

Resource optimization, mainly material and energy, is a common practice to enhance the sustainability of the business model³⁴. This is possible by increasing product use through sharing or renting and extending the material and product lifecycle by adding services and applying end-of-life strategies such as remanufacturing, reuse, and recycling. These actions lead to waste and energy minimization. In SPSS development, it is also essential to consider standardization and modularity aspects that help reduce process time and cost, as well as durability and longevity aspects that extend the product lifecycle³⁵. Furthermore, cost savings are a consequence of reduced quantities of product materials required³⁶ and from postponed disposal and manufacturing costs for new products³⁷ as well as updating, repairing, remanufacturing, and recycling product actions.

However, the symbolic value associated with owning products, particularly those with strong cultural associations such as cars, presents a challenge to the potential success of SPSS. To overcome this hurdle, customer behavior must be addressed through education, involvement, and a thorough understanding of their needs and values. By doing so, SPSS can not only meet customers' needs, but also transform them, ultimately increasing customer satisfaction and acceptance³⁸. Aspects that can increase customer acceptance and satisfaction include appearance, usability, price, safety, cost and time savings, and sustainability³⁹.

³¹ Vezzoli, C., Ceschin, F., Diehl, J.C., Kohtala, C. (2015). New design challenges to widely implement 'sustainable product-service systems. *J. Clean. Prod.* 97, 1–12.

³² Hazée, S., Vaerenbergh, Y.V., Delcourt, C., Kabadayi, S., (2020). Service delivery system design for risk management in sharing-based product service systems: a customer-oriented approach. *Int. J. Oper. Prod. Manag.* 40 (4), 459–479.

³³ Botsman, R., Rogers, R., (2011). *What's Mine Is Yours: How Collaborative Consumption Is Changing the Way We Live*. Collins, London.

³⁴ Barquet et al. (2016)

³⁵ Hu, H.A., et.al. (2012) Development of sustainability evaluation model for implementing product service systems. In: *International Journal of Environmental Science and Technology*, 9; p. 343–354

³⁶ Vezzoli, C., Kohtala C., Srinivasan, A. (2014). *Product-Service System Design for Sustainability*. Learning Network on Sustainability. Sheffield: Greenleaf Publishing Limited;

³⁷ Vezzoli C., et.al. (2015) New design challenges to widely implement 'Sustainable Product-Service Systems'. In: *Journal of Cleaner Production*, 97; p. 1-12

³⁸ Mylan, J. (2015). Understanding the diffusion of Sustainable Product-Service Systems: Insights from the sociology of consumption and practice theory. In: *Journal of Cleaner Production*, 97; p. 13-20

³⁹ Chou, Ch., Chen, Ch., Conley Ch. (2015). An approach to assessing sustainable product-service systems. In: *Journal of Cleaner Production*, 86; p. 277-284

By shifting ownership to providers, access to goods and services can be broadened to lower income segments, as SPSS becomes functionality-oriented rather than ownership-oriented⁴⁰, leading to lower initial investment and running costs for customers, ultimately improving their quality of life.

When the system uses fewer resources, overall costs decrease and gains increase, which can be shared among stakeholders⁴¹. Technological innovation may be required to avoid higher initial investment for service providers, such as through the use of easily adoptable or more efficient technologies. These technologies can also lead to more environmentally friendly products through the reduction of energy consumption, materials, and emissions⁴². Finally, information and communication technologies (ICT) can shift the production of value from hardware to software, enabling the development of new services like shared transport in a more user-friendly and convenient way⁴³.

In conclusion, the emergence of SPSS business models has the potential to stimulate sustainable consumption practices and foster a shift towards resource access and sharing. This shift can contribute to mitigating issues such as overconsumption, environmentally-driven resource utilization, and the degradation of the natural environment. By encouraging renting, sharing, swapping, or lending of idle goods, SPSS models maximize consumption while minimizing resource utilization. However, it is not always certain that SPSS models produce environmental and social value, as they may be linked to negative side-effects and trade-offs that can impact the overall value⁴⁴. In fact, it is worth mentioning that even if adopting SPSS can be beneficial for firms to achieve sustainability, it did not prevent cases of bankruptcy⁴⁵. Therefore, it is increasingly important to know how a SPSS should be designed on an operational level to achieve sustainable goals and what contingent factors should be paid more attention to when sharing platforms' operators run their business, upon which few prior research have touched⁴⁶.

1.4 Carsharing: a Shared-based Product-Service System

In recent years, carsharing is a SPSS that gained widely-recognized attention due to its potential for sustainable development. By offering users access to cars on a short-term basis, it allows for more efficient use of resources, reducing the environmental, social and economic impacts of private mobility. The system of carsharing, as defined for the purposes of this research, is use-oriented and provides users with the benefits of both the product (car) and service (transportation). This places carsharing between pure product

⁴⁰ Vezzoli C., et.al. (2015)

⁴¹ Manzini, E., Vezzoli, C. (2003). A strategic design approach to develop sustainable product service systems: examples taken from the 'environmentally friendly innovation' Italian prize. In: *Journal of Cleaner Production*, 11/8; p. 851-857

⁴² Liu, Ch.H., et.al. (2014). Constructing a sustainable service business model: An S-D logic-based integrated product service system (IPSS), In: *International Journal of Physical Distribution & Logistics Management*, 44/1,2; p.80 – 97

⁴³ Roy, R. (2000). Sustainable product-service systems In: *Futures*, 32/3,4; p. 289-299

⁴⁴ Chaudhuri, R., Chatterjee, S., Ghosh, A. P., Vrontis, D., & Thrassou, A. (2022). Sustainable innovation for shared mobility: contextual and consumer factors of an Indian car subscription business model. *International Journal of Entrepreneurial Behaviour & Research*. <https://doi.org/10.1108/ijeb-01-2022-0090>

⁴⁵ Ibid

⁴⁶ Li., D., Huang Y., Sun, H., & Zhi, B. (2021)

and pure service systems. While the tangible part of the system is the car, the intangible element is the transportation service, serving as functional component.

Carsharing services have become increasingly popular as a means of transportation for individuals who require temporary access to a car without the expense of owning one. This SPSS allows users to access a vehicle when needed, without having to bear the burden of maintenance costs, insurance premiums, and other ownership expenses. As anticipated in the previous paragraph, such models are enabled by digital platforms that connect individuals or companies that own vehicles with those who require them.

Key components of a carsharing service include an entity providing vehicles for temporary use, a group of users who require access to the vehicle and a digital platform that facilitates the interaction between the provider and user. Carsharing users' expectations include the ability to make trips according to their own needs, evaluation of convenience and a user experience that is simple, convenient, and safe.

Digital platforms enabled the integration of organizational models that allow users to rent vehicles for short periods without requiring dedicated staff interaction. Platforms attribute several characteristics to carsharing services⁴⁷, such as:

- Reticularity, referring to the use of digital platforms to ensure that users can reserve, pick up, and drop off a car without interaction with dedicated staff.
- Interactivity, enabling continuous exchange of information and data between users and service providers.
- Collaboration, leveraging the skills and experience of the driver to make the best use of a car, and also involves the formation of a network and community with real coordination practices based on exchange and giving.
- Accessibility, referring to ease of access through the use of a smartphone, resulting in a user-friendly experience.

In the next paragraphs, the foundations of a carsharing business model will be discussed, as it comes in different forms that emerge from the combination of economic and operational models⁴⁸.

1.4.1 Economic model of carsharing

The economic model of carsharing is based on four main factors: the entity that provides the vehicles, the group of individuals who can access them temporarily, the relationship between the parties involved, and the type of transaction that takes place⁴⁹.

⁴⁷ Fondazione per lo sviluppo sostenibile; ICS; Osservatorio nazionale sharing mobility; (2020), "Carsharing Toolkit", 22

⁴⁸ Karla Münzel, Wouter Boon, Koen Frenken, Jan Blomme & Dennis van der Linden (2019): Explaining carsharing supply across Western European cities, International Journal of Sustainable Transportation, DOI: 10.1080/15568318.2018.1542756

⁴⁹ Fondazione per lo sviluppo sostenibile et al. (2020)

Three distinct types of carsharing have been identified in the academic literature: business-to-consumer (B2C), peer-to-peer (P2P) and cooperative carsharing⁵⁰. For the purpose of this study, only business-to-consumer models will be addressed.

In business-to-consumer (B2C) models carsharing operators own and operate a dedicated fleet of vehicles and charge fees based on temporary access to the service. Fees are typically time-based or distance-based, an entry fee can be added. As carsharing allows for short-term rental, it is usually used for urban trips. B2C carsharing models can also be adopted for other shared uses, such as corporate fleets not used on weekends, or restricted to a specific community of users, such as a university campus or housing complex.

1.4.2 Operating model of carsharing

The operating model of a carsharing service relates to space and types of travel by duration and availability of vehicles. The deployment of vehicles in a carsharing service is designed to provide the best matching of cars and users, taking into considerations supply and demand for mobility. The way vehicles are deployed has significant impacts on the efficiency and effectiveness of the carsharing service. There are four different configurations for vehicle deployment⁵¹:

- 1) Deployment of one or more vehicles close to a pool of demand;
- 2) Network distribution consisting of groups or "clusters" of cars forming a station;
- 3) Network with a discrete number of nodes whose location is not fixed;
- 4) Dynamic network without real limits to its spatial extent.

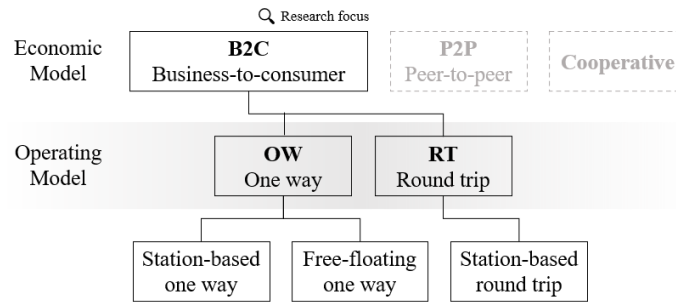
The configuration of vehicle deployment interacts with the type of trip allowed, namely one round-trip or a one-way trip. The former satisfy the need of a car for a period of time within which the user makes one or more trips and stops until the return trip is made. The latter is the need for a single trip from point A to point B, without excluding the possibility of intermediate stops. These are occasional needs and not made systematically every day. The combination of the spatial distribution of vehicles with type of travel leads to the identification of three operating models: station-based round-trip, station-based one-way and free-floating one-way⁵².

⁵⁰ Bauwens, M., Mendoza, N., & Iacomella, F. (2012). Synthetic Overview of the Collaborative Economy. P2P Foundation

⁵¹ Fondazione per lo sviluppo sostenibile et al. (2020)

⁵² Cohen, B. & Kietzman, J. (2014). Ride On! Mobility Business Models for the Sharing Economy. *Organization & Environment*, 27(3), 279-296

Carsharing Configurations



Source: Personal elaboration

The B2C model can indiscriminately adopt all operating models, all network and trip type configurations.

1.4.3 A focus on station-based and free-floating carsharing configurations

First, station-based models' main feature is the parking of cars in reserved areas and they are declined into "round trip" or "one way" operating models. If the model is round trip, users can reserve the car, which is generally picked up at stations, and can return it at the same station. Instead, if the model is one way, cars can move from e.g. station A to station B in a different location⁵³. Therefore, the service provides reserved stalls, usually on the road, for pick-up and drop-off. Round trip station-based services typically include longer, less frequent, or routine travels. As a result, despite having fewer drivers, cars experience more wear and tear. They frequently have a greater variety of fleets and do not always have to be situated in big, dense cities to be prosperous⁵⁴. As the model ensures the availability of the car at the time when needed, it is particularly suitable for scheduled displacements hardly to be performed by different means. Reservations are made through the web or app, and access to the car is done through the app itself or smart card. Fleets often consists of more than one model of car, with a general preponderance for city cars. In many situations, operators also provide vans, which can meet the needs of small items of transport. Refueling is usually done by the customer, using means of payment from the operator available on the car, with the cost charged directly to the service operator. Cleaning and maintenance of the fleet, on the other hand, is done by the operator. The use of electric cars is rather easy in this type of scheme, as they are released at predefined stations that can be equipped with charging systems where urban conditions permit.

Second, free-floating carsharing, which by its nature does not involve the exploitation of predefined parking spaces or serial parking stalls, except in specific cases, but favors freedom of movement and parking. Location and rental of vehicles is based on mobile applications. To end the ride, cars can be parked within the release area defined by the carsharing service provider. The area identified for pick up and release is crucial, as it controls variables such as fleet sizing and potential users. A balance should be identified to attract sufficient users and offer significant city coverage, not generating excessive fleet dispersion in areas

⁵³ Machado, C. A. S., De Salles Hue, N. P. M., Berssaneti, F. T., & Quintanilha, J. A. (2018). An overview of shared mobility. *Sustainability*, 10(12), 4342

⁵⁴ Monitor Deloitte. (2017). *Carsharing in Europe: Business models, national variations and upcoming disruptions*.

with low demand. Moreover, the larger the area, the more numerous the fleet will be to ensure good chance of finding a car within reasonable distance⁵⁵. As vehicle release cannot be determined *a priori*, it may happen frequently that their distribution, at a certain time, does not meet demand and vehicle repositioning is needed. Free-floating models can thus be more expensive to operate than station-based ones. Often fleets consist of only one model of car per operator, usually a city car; however, exceptions are present. The operator directly provides cleaning and maintenance of the fleet and refueling of the cars, with appropriate handling operations.

Free-floating carsharing is suitable for making a very large number of short trips in urban areas, and for this reason it has a much larger actual and potential user base than station-based carsharing. Finally, due to its characteristics, this model requires from the start of the service large fleets in relation to the area served and allows more difficult gradual growth. In contrast, it ensures significant user levels from the start. It is particularly suitable for those areas that have high mobility demand, population, presence of urban polarities and compactness of the built-up area.

Finally, whether station-based or free-floating, carsharing is subject to a condition of economic balance and profit margin creation. In a carsharing company, the individual car is the unit of production. The company's cost structure is divided into two categories: direct costs and indirect costs⁵⁶. Direct costs are directly related to the acquisition, maintenance, and use of the car, as well as service management systems. Direct costs can be further categorized into fixed direct costs and variable direct costs. In contrast, indirect costs are associated with the overall organization and management of the enterprise.

In terms of revenue, fees for the use of free-floating services are typically time-based, although they may include specific terms for certain user categories, prepaid minute packages, or other forms of pricing that stimulate demand from specific user segments. For full-day or weekend rentals, rates may also factor in distance traveled⁵⁷. Station-based services require rates that are related to the duration of the rental and distance traveled, and often involve a fee to sign up for the service.

1.4.4 Car ownership reduction

A shared car can cover trips for different people, who instead of taking their private car may use carsharing. The "car ownership reduction" effect has been studied to identify a substitution ratio between carsharing and private cars, whereas results are often discordant. Among various indicators of modal shifts impact among carsharing users, including vehicle miles traveled, greenhouse gas emissions, and changes in demand for other transportation means, the percentage reduction of car ownership is the most cited. However, it is difficult to establish a causation link between the presence of carsharing and the reduction

⁵⁵ Fondazione per lo sviluppo sostenibile et al. (2020)

⁵⁶ Ibid

⁵⁷ Ibid

of car ownership. In some contexts, after the introduction of carsharing, it has been observed a change in the purchasing behavior and modes of travelling of people that adopted the solution, possibly explaining why motorization rates may decrease. Some studies refer to selling previously owned vehicles, delaying the acquisition of a car, or deterring users from buying a car (see appendix)⁵⁸. Usually, the effect differs from free-floating to station-based, where the latter usually has a higher impact. From a literature review it emerges that on average station-based models reduce car ownership by ~33%, while free-floating model's impact on car ownership reduction ranges from ~2% to ~23%⁵⁹.

1.5 Research gaps

A review of the current academic literature on the subject matter of this research has been conducted by the author, allowing for a deeper theoretical understanding of the topics and the context being researched. The literature extensively studied the theory behind sustainable development and sustainable business model, carsharing included. However, it appears from the literature review that there is a lack of practical, systematic, and structured connection between these concepts. Particularly, the relationship between the underlying value creation, delivery, and capture dynamics of carsharing business models and their potential contribution to the sustainable development of urban mobility as measured by SDGs has not yet been thoroughly examined. Also, in the specific context of Italy, there is no evidence of academic studies mapping the challenges facing the carsharing industry and explaining how these affect the value capture dynamics of operators. Therefore, despite the academic effort, three areas where literature is scarce have been identified:

- The potential contribution of Italian carsharing operators to the SDGs in promoting the sustainable development of urban mobility.
- The key business model elements and external factors that support Italian carsharing operators in creating and delivering value.
- The challenges that currently hinder Italian carsharing operators' value capture dynamics.

Given the inductive nature of this work, to address these gaps the researcher plans to collect qualitative data and contribute to the literature by deepening the study of the above-mentioned topics. These three topics are crucial in answering the main research question, which aims to understand if carsharing operators can effectively support the sustainable development of urban mobility in Italy.

⁵⁸ Bucsky, P., & Juhász, M. (2022). Is car ownership reduction impact of car sharing lower than expected? A Europe wide empirical evidence. *Case Studies on Transport Policy*, 10(4), 2208-2217.

⁵⁹ Studies considered for the literature review (see appendix): Firnkorn & Müller (2011), 6T-Bureau De Recherche (2014), Le Vine, Lee Gosselin, Sivakumar & Polak (2014), Giesel & Nobis (2016), Nijland & van Meerkerk (2016), Kolleck (2012-2017), Hausteiner (2017), Becker, Ciari & Axhausen (2017-2018), Le Vine & Polak (2018), Wu, Le Vine, Clark, Gifford & Polak (2018), Ceccato, Chicco & Diana (2019), Mounce & Nelson (2019), CoMoUK (2020)

2. METHODOLOGY

This chapter delves into the decisions that were made regarding the nature and structure of the research, along with the techniques and methods used for collecting and analyzing the empirical data. The initial section outlines the research strategy, while the second section describes the chosen research design and reasons for rejecting alternative structures. Third and fourth sections elaborate on data collection methods and sampling criteria. The fifth section focuses on data analysis approach. Finally, the last section details how research satisfied quality standards⁶⁰.

2.1 Research strategy

In the realm of business research, the research strategy refers to the overarching approach utilized by a researcher in conducting their project⁶¹ - quantitative, qualitative, or mixed strategy. The selection of an appropriate research strategy is contingent upon the specific research methods employed during the data collection phase⁶². For the work at hand, the author opted for a qualitative strategy due to the utilization of semi-structured interviews.

To develop a suitable qualitative research strategy, the connection between theory and research will be established through inductive approach, which entails that the primary findings are employed to foster the development of novel theories in the field⁶³. By following this methodology, the author aims to integrate existing literature on the subject matter by leveraging the primary data gathered through the conducted interviews.

2.2 Research design

The research design is a crucial component of academic research as it serves as a framework for collection and analysis of data to answer the primary research question and its sub-questions⁶⁴. In the realm of business and management research, there exist five distinct types of research design depending on characteristics, advantages, and disadvantages: experimental design, longitudinal design, cross-sectional design, comparative design, and case study.

After considering the research strategy employed and the purpose of this study, the multiple case study design was selected for its ability to transcend the limitations of a single, isolated case. A multiple case study allows for analysis within and across situations, while a single case study is better for studying individuals or groups and questioning old theoretical relationships or exploring new ones⁶⁵. Multiple case

⁶⁰ Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin, & Y. S. Lincoln, *Handbook of qualitative research* (pp. 105-117). Sage Publications.

⁶¹ Bell, E., Bryman, A., & Harley, B. (2018). *Business Research Methods*. Oxford: Oxford University Press.

⁶² Ibid

⁶³ Ibid

⁶⁴ Ibid

⁶⁵ Yin, R. K. (2009). *Case study research: Design and methods*. Thousand Oaks, CA: Sage

studies provide strong and reliable evidence and can uncover similarities and differences between cases but can be time-consuming and expensive⁶⁶. On the other hand, single case studies produce high-quality theories and provide a deeper understanding of the subject but may not be as representative due to a lack of observation time⁶⁷. In addition, a comparative approach was also adopted to attain a more comprehensive understanding of the phenomenon being studied across various contexts.

The researcher conducted an analysis of a sample of Italian carsharing operators, comparing them to identify similarities and differences in how their services potentially contribute to the sustainable development of urban mobility as measured by the SDGs. The study also examined the key business model elements and external factors that support Italian carsharing operators in creating and delivering value.

Additionally, the research investigated operators' perceptions regarding the challenges currently affecting their value capture dynamics.

By comparing the various Italian carsharing providers in the B2C segment operating station-based and free-floating models, the researcher was able to investigate the research topic in deliberately distinct and diverse contexts, providing a comprehensive understanding of the relationship between carsharing business models and sustainable development of urban mobility based on the theoretical concepts outlined in the second chapter⁶⁸.

For the sake of clarity and quality of the research, it has to be specified that other common and robust research designs were excluded because they did not align with one or more dimensions of the methodology used in this research. For example, experimental design is primarily used for confirmatory research, longitudinal design requires the sample to be studied at various points in time, and cross-sectional design entails studying subjects at a single point in time to analyze population variations⁶⁹.

2.3 Research method

Data collection allows for collection of information needed for addressing the research questions posed⁷⁰. In this study, both primary and secondary qualitative data were used. The methods used for data collection and rationale are explained below.

2.3.1 Primary data collection

The primary data gathering was performed throughout semi-structured interviews, being the best fit to collect unique insights from managers' points of view and trace connected paths. In addition, the detailed

⁶⁶ Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4), 544-556.

⁶⁷ Gerring, J. (2004). What Is a Case Study and What Is It Good for? *The American Political Science Review*, 98(2), 341-354.

⁶⁸ Goffin, K., Åhlström, P., Bianchi, M., & Richtnér, A. (2019). Perspective: State-of-the-Art: The Quality of Case Study. *Journal of Product Innovation Management*, 586-615.

⁶⁹ Bell et al. (2018)

⁷⁰ Ibid

interview guide allowed for comparable answers to conduct the analysis (see appendix). Unstructured interviews were discarded because they were less effective for the characteristics and purpose of this work. Primary qualitative data were collected to increase the quality and solidity of this work and to ensure alignment between the research problem and research questions. The thematic analysis method used in this research also made it essential to be familiar with the data collected.

The primary data were gathered by interviewing both a sample of Italian carsharing operators and industry stakeholders who acted as subject matter experts to better understand the dynamics of the sector and provide insights into contingent factors. The interviews with the second sample provided a complementary point of view on the topics covered in this study, providing specific evidence to support outlining the industry overview. The author asked “*Osservatorio Nazionale Sharing Mobility*” (OSM) to extract primary data from their database to perform a more accurate industry analysis.

2.3.2 Secondary data collection

The secondary data were collected to elaborate an extensive literature review, as well as both qualitative and quantitative data for the industry overview, as they serve to obtain a thorough understanding of the area of interest, to provide a foundation for the primary data collection phase and serves as a reference point for the ensuing analysis.

Analysis of the industry was performed on data gathered from a variety of sources, mainly from OSM, Web of Science, Scopus, Google Scholar, Luiss University library, and Copenhagen Business School library.

Lastly, the author conducted a sentiment analysis of mobile applications’ reviews of Italian carsharing operators’ sample, allowing to gather insights from publicly available secondary data provided by consumers. The main goal of this analysis was to identify the most important and recurring topics found in the reviews. The analysis was carried out exploiting an artificial intelligence tool that supported the investigation. By enriching the research in this way, additional elements were obtained to address the research questions at hand.

2.3.3 Interview guideline

To ensure the reliability and comparability of collected data, the semi-structured interview method required the creation of three interview guides before conducting two rounds of interviews (see appendix). This method was deemed necessary given the research design to guarantee consistency across cases under study⁷¹. The first interview guide was designed to gather information on the three primary areas of interest of this research. The second and the third focused on obtaining the opinions and perspectives of industry stakeholders and deepening the understanding of the technicalities of the carsharing sector in Italy.

⁷¹ Ibid

2.4 Sampling

In conducting the research, the author employed a non-probability sampling method, namely “purposive sampling”, to select the companies to interview. Among various types of purposive sampling, criterion sampling was deemed the most suitable for this study⁷². Two separate samples were built to ensure a comprehensive analysis and obtain complementary perspectives.

The first sample consisted of Italian carsharing operators chosen for the multiple case study. The author used specific criteria to select these companies, including the presence of free-floating or station-based models and differentiation at corporate group level among Transportation, Automotive, and Energy. The sample also aimed to capture both larger companies with a significant market share and smaller companies with lower shares. To ensure the selection of experienced and knowledgeable respondents, only those with a managerial and strategic role in their company were included. Respondents were contacted through personal e-mail contact, LinkedIn profile, or selected by the companies themselves following inquiries from the author to press offices and customer service.

Sample of Italian carsharing operators & interviews' information

Carsharing	Company	Model	Corporate Group	Group industry	Respondent	Role	Date	Lenght	Platform
E-Vai	E-VAI S.R.L.	SB	FNM S.p.A.	Transportation	Matteo Brambilla	Head of Marketing	March 31, 2023	60 min	Google Meet
E-Vai	E-VAI S.R.L.	SB	FNM S.p.A.	Transportation	Francesco Pedol	Head of New Business Development	March 31, 2023	60 min	Google Meet
Enjoy	ENI SUSTAINABLE MOBILITY S.P.A.	FF	ENI S.p.A.	Energy	Massimo Rovatti	Head of Smart Mobility	April 20, 2023	60 min	Microsoft Teams
E-Go	DRIVALIA S.P.A.	FF	CA AUTO BANK S.p.A.	Automotive	—	Carsharing Manager	April 27, 2023	50 min	Google Meet
Share Now	CAR2GO ITALIA S.R.L.	FF	SHARE NOW GMBH	Automotive	Luigi Licchelli	Head of Business Development & Public Affairs	April 28, 2023	60 min	Google Meet
Corrente	OMNIBUS S.C.A.R.L.	FF	TPER S.p.A.	Transportation	Luca Astolfi Paola Matino	Carsharing Coordinator Mobility Manager	May 3, 2023	60 min	Microsoft Teams

Source: Personal elaboration

The second sample consisted of two key stakeholders who could provide insights into the carsharing sector and its contingent factors. The stakeholders were selected based on one criterion: their distinct roles and interests within the carsharing sector. A municipality was selected (specifically Rome) to provide valuable insights into the operator-municipality relationship, while OSM was chosen for its extensive expertise and knowledge of the sector's trends and technicalities. Respondents were contacted via e-mail following a request from the author to the institutions.

⁷² Patton, M. Q. (1990). *Qualitative evaluation and research methods*. SAGE Publications, inc.

Sample of key Italian carsharing stakeholders & interviews' information

Stakeholder	Interest	Respondent	Role	Date	Lenght	Platform
Osservatorio Nazionale Sharing Mobility	Industry POVs	Massimo Ciuffini	Sustainable Mobility Coordinator	April 3, 2023	60 min	Microsoft Teams
Agenzia Roma Servizi per la mobilità	Local Administration	Marco Volpe	Head of Rules and Processes Area	April 7, 2023	40 min	Microsoft Teams

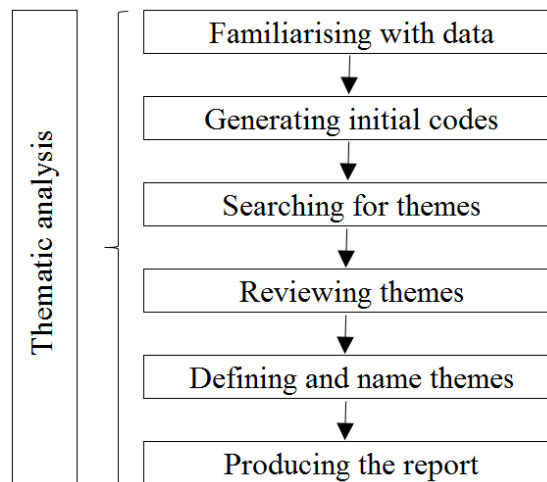
Source: Personal elaboration

Overall, the use of purposive sampling enabled the researcher to strategically select a sample of companies and stakeholders that would provide valuable insights into the research questions. By constructing two separate samples, the study could achieve a more complete analysis of the carsharing market.

2.5 Data analysis

Thematic analysis was employed in this study to ensure a reliable and rigorous analysis. This method's primary goal is to identify all the recurrent patterns in the collected data that can be used to answer the research questions⁷³. To conduct a systematic and comprehensive analysis, the "Six-phase Framework" was followed⁷⁴.

The process of thematic analysis



Source: adapted by Dat Doan from Clarke and Braun (2013)

At a preparatory stage, after the data collection phase, the author made literal transcriptions of the interviews using Microsoft Word Online to avoid personal contamination. The transcripts were thus analyzed and initial notes were taken on similar answers and possible second-order concepts.

In the second step, first-order concepts were identified from collected data without selecting any predetermined codes. NVivo, a qualitative data analytic software, was used to study the data and proceed

⁷³ Maguire, M., & Delahunt, B. (2017). Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars. Aishe J.

⁷⁴ Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The Psychologist*, 120-123.

to the coding phase. Only the codes useful for answering the research questions presented in the introduction were selected.

In the third step, the researcher identified second-order concepts in the respondents' answers.

In the fourth step, the selected themes were reviewed to ensure coherence and usefulness in answering research questions. The first-order concepts in each pattern were checked.

In the fifth step, the second-order themes were grouped into three aggregate themes, relying on the areas of interest identified by the research questions.

Finally, the last step involved writing this research paper.

The systematic and comprehensive approach to analysis ensured that all the recurrent patterns in the collected data were identified and used to answer the research questions effectively.

2.6 Research quality

In evaluating business research, three main factors should be assessed⁷⁵: reliability, replicability, and validity.

However, these criteria are not suitable for all types of research. In particular, the concepts of reliability and validity are only appropriate for evaluating quantitative research. Qualitative research requires a different approach to evaluation. Academia proposed an alternative framework adapting the above criteria to qualitative research and including two primary criteria: trustworthiness and authenticity⁷⁶.

Trustworthiness is grounded in the assessment of credibility, transferability, dependability, and confirmability. Credibility refers to granting concordance between interviews and research findings. To meet this criterion, a careful literature review of the phenomenon under analysis and of the general and specific context in which it occurs was carried out. Respondents were selected based on specific criteria related to research purposes. Interviews recordings and literal transcripts were used to carry out the coding process. Empirical findings were sent to all interviewees who requested them for confirmation, ensuring transparency and reliability.

Transferability refers to the ability of the final findings to be applied to other realities, contexts, or environments other than the one analyzed. This is one of the main problems of qualitative research since it usually studies small groups. However, even if this research focuses only on carsharing, the researcher tried to increase the level of transferability by selecting firms belonging to different corporate groups and contexts, to foster generalizability of results.

⁷⁵ Bell et al. (2018)

⁷⁶ Guba, E. et al. (1994)

Dependability requires that all stages of the research process be tracked. To meet this criterion, all stages of the work were carefully explained to all respondents, starting with the formulation of the research questions, the choice of methodology, and ending with the analysis of the collected data.

Confirmability requires that the research be objective and unbiased by the author. The researcher remained neutral throughout the work and during the data collection and analysis phase, adhering exclusively and scrupulously to the opinions provided by the respondents. As previously mentioned, the interview transcripts were transcribed in a literal manner to avoid personal contamination.

Finally, the authenticity criterion was addressed, which refers to the extent to which researchers accurately capture and portray a diverse range of realities. In this regard, the researcher made an effort to present a comprehensive picture of the relationship between Italian carsharing operators and sustainable urban mobility. This was achieved by conducting interviews with representatives from various companies and, by doing so, the author aimed to meet this criterion and provide an accurate portrayal of the situation.

3. INDUSTRY OVERVIEW

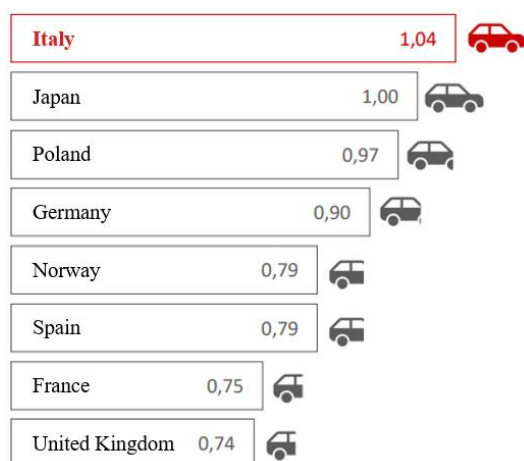
The United Nations Framework Convention on Climate Change (UNFCCC) recognizes the importance of building sustainable transportation to tackle the climate crisis⁷⁷: “*Transportation is a vital sector but our current mobility system is simply not sustainable*”⁷⁸. On the environmental dimension, the transport sector accounted in Italy in 2019 for 25.2% of total greenhouse gas emissions and 30.7% of total CO₂ emissions, with road transport contributing to 92.6% of these emissions⁷⁹. On the social and economic dimensions, Italy has the second-highest motorization rate in Europe after Luxembourg, leading to chronic traffic congestion issues that causes significant economic losses due to productivity decline for lost work hours in urban traffic, making the city environment unpleasant⁸⁰.

The chapter provides a contextual analysis of mobility in Italy by examining the current state of the private car market and exploring the carsharing sector as an alternative to private mobility, delving into the current state of the industry and discussing sector’s dynamics and major trends emerging from secondary data.

3.1 Overview of the Italian car market

Italy counts 38.5 million cars for private use⁸¹ and has the second-highest density of cars per 1,000 people in Europe after Luxemburg. The fact that this is accompanied with a higher motorization rate (registered cars per 1000 inhabitants) than in the other main European nations (Germany, France, Spain, UK) – 642 cars in Italy compared to an average of 553 in the other four – is also widely recognized⁸². When considering only driving aged people, Italians practically have more than one car each (on average).

Cars per capita driving age (2020, 18-65 years old)



Source: World Bank, ISTAT

⁷⁷ UNFCCC (2019). “Sustainable transport key to tackling the climate crisis”

⁷⁸ European Environment Agency (2023). Transport and mobility. Available online: [Link](#)

⁷⁹ MIMS (2022). Decarbonising Transport: Scientific evidence and policy proposals. Available online: [Link](#)

⁸⁰ MIMS (2022). Climate-neutral cities zero: strategies and policies. Available online: [Link](#)

⁸¹ Automobile Club d’Italia (2021). Autoritratto 2021. Available online: [Link](#)

⁸² UNRAE (2022). “The automobile: Italians compared”. Available online: [Link](#)

The high dependence on private motor vehicles is strongly associated with the lower availability or more challenging accessibility to public transportation, particularly in smaller municipalities outside major metropolitan areas. Despite plummeting car sales and one of the highest motorization rates, the circulating fleet continues to grow virtually unabated. But bearing the brunt of this is the average age of the fleet, which continues to rise, portending a "Cuba Effect"⁸³ for Italian mobility. In fact, Italy is well known for having the oldest vehicle fleet among the five major European markets: in 2021 the average age of cars on the road is 11.5 years, as opposed to the average age of the other four countries, which is 9.9 years (8.0 in the UK, 9.6 in Germany, 10.2 in France, and 12.7 in Spain)⁸⁴.

The share of the newer and greener technology car segment in Italy – cars with 0-5 years old and Euro 6 engines – amounts to only 22.8% in 2021. This is indicative of an ageing and polluting circulating fleet that is not only old, making it highly unsafe and polluting, but also in serious and progressive deterioration, with an average age that has increased by 44% in the last 10 years, there is still evidence of its less efficient use in terms of costs, even after considering all the potential explanations for the different intensities and modes of car use in comparison with the other countries taken into consideration.

Equally depressing in European comparison is the share of electric cars for private use: at the end of 2021, the former amounted to 0.2% of the total as shown in the figure below⁸⁵.

EVs penetration rate for private use cars, Italy (2021)

Type of fuel	Absolute (n)	Relative (%)
Gasoline	17,453,684	45.4%
Gasoline and liquid gas	2,751,393	7.2%
Gasoline and natural gas	799,949	2.1%
Diesel	16,256,178	42.3%
Natural gas	167,209	0.4%
Hybrid gasoline	835,452	2.2%
Hybrid diesel	82,011	0.2%
Electricity	84,356	0.2%
Other	593	0.0%
Undefined	1,264	0.0%
Total	38,432,089	100.0%

Source: Personal elaboration on data from ACI

Such penetration rate was in line with Spain, but far from Germany and France's 1.4%, and the UK's 1.1%⁸⁶. Numerous dissimilar factors, such as a lack of charging infrastructure, lower household spending capacity (EVs are known to be significantly more expensive than ICEs), and a lower penetration of company cars (which typically have a higher "propensity" toward new fuels) contribute to the lower penetration of EVs in the Italian market. Looking at public charging infrastructures in terms of the number of charging points

⁸³ It's called the Cuba effect, when the middle classes have no money to buy technology that costs a lot of money and there is no replacement of the car fleet.

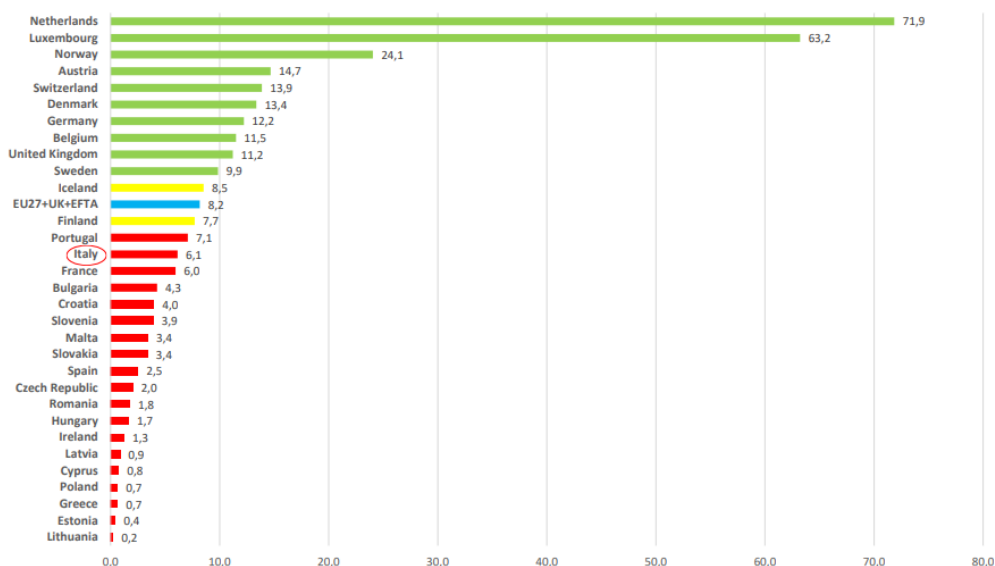
⁸⁴ Ibid

⁸⁵ Automobile Club d'Italia (2021)

⁸⁶ Ibid

per 100 km (with data as of June 2022), periodic census reveals a gap between Italy (6.1 charging points / 100 km) and Germany (12.2, exactly twice as many), the United Kingdom (11.2), as well as the European average of 8.2 charging points⁸⁷. The outliers in this case are Netherlands (71.9) and Luxembourg (63.2), as shown in the figure.

Capillarity of public charging infrastructure (CP/100 km, June 2022)



Source: EAFO (European Alternative Fuels Observatory), June 2022

In conclusion, the Italian private car market scenario presents an ageing circulating fleet and overpopulation of cars in the cities. Such overpopulation often results in cars remaining idle for 95% of their useful life⁸⁸, leading to traffic congestion and road space issues. Furthermore, the impact of transport on emissions makes this situation particularly concerning and in need of immediate action before the effects become irreversible. Carsharing can be a potential solution to this issue as it seeks to maximize car use and decongest urban roads by moving more people with less cars. The European Environment Agency (EEA), in their strategy for low-emission mobility, considers shared mobility essential in the shift to a low-carbon economy⁸⁹. The EEA encourages cities to undertake a multi-modal shift in the mobility sector, including carsharing as a shared mobility option, to reduce congestion and pollution in cities.

3.2 Analysis of the Italian carsharing market

As mentioned in the literature review, this is a key feature of SPSS models embedded in sharing mobility solutions which are seen as a potential answer to some of the transportation sector problems in cities at both national and European levels. In Italy, however, the carsharing market seems to be experiencing a stagnation, which is a cause for concern. In the following paragraphs, a thorough analysis of the Italian carsharing market will be conducted, supported by the insights gathered from interviews with “Agenzia

⁸⁷ Ibid

⁸⁸ Shoup, D.C. (2017). The high cost of free parking, updated Routledge

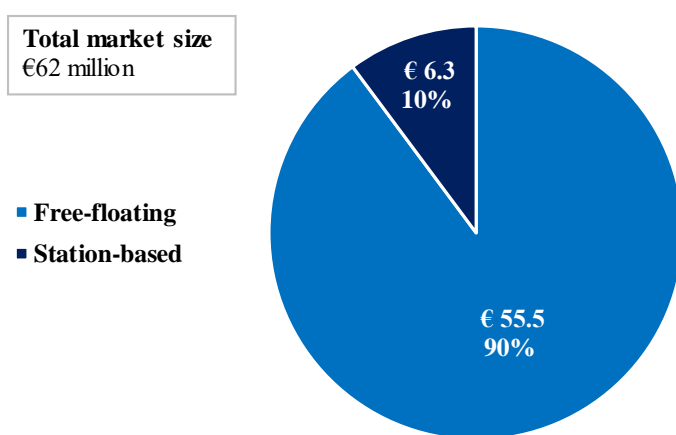
⁸⁹ European Environment Agency (2016). A European Strategy for Low-Emission Mobility. Available online: [Link](#)

Roma Servizi per la Mobilità”, to better understand the role of local administrations, and OSM, to establish a solid foundational knowledge of the sector that will serve as a basis for the subsequent empirical analysis.

3.2.1 Key figures and interpretations

In 2021, according to OSM estimates, the Italian carsharing market was worth in terms of turnover about €61.8 million, where free-floating carsharing absorbed about 90% market share - €55.5 million - and station-based the remaining 10% - €6.3 million -, immediately highlighting a great disparity in market size and turnover between these two models⁹⁰.

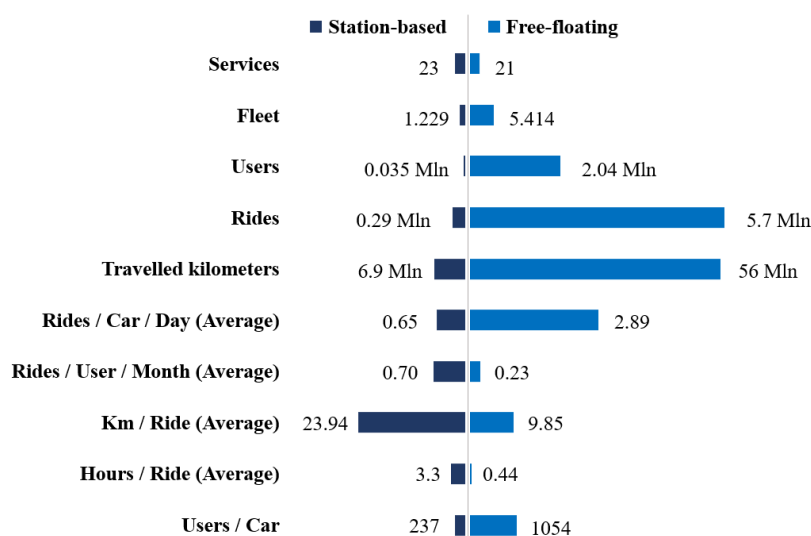
Italian carsharing market size (2021) – Free-floating and Station-based



Source: Personal elaboration from OSM data

Considering the situation as of 2021, it can be seen that from the direct comparison between free-floating and station-based the order of magnitude of the numbers greatly differs, due to the different nature of the services, as explained in the literature review section.

Comparison of free-floating and station-based carsharing in Italy (2021)



Source: Personal elaboration from OSM data

⁹⁰ Osservatorio Nazionale Sharing Mobility (2022). 6° Rapporto Nazionale sulla Sharing Mobility. Available online: [Link](#)

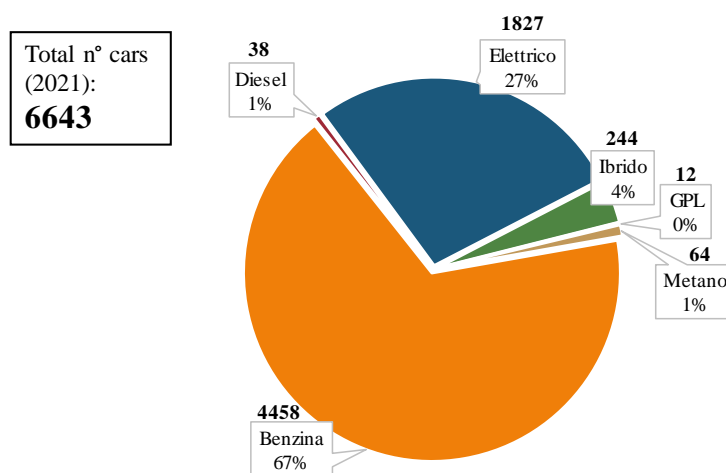
First of all, according to the latest available data, the number of services between two types of carsharing is mostly evenly distributed (21 free-floating, 23 station-based), while the same cannot be said for the number of vehicles in the fleet.

Out of a total of 6643 vehicles in 2021, where about 82% belong to the free-floating models, in line with the service's own characteristics discussed in the last chapter.

In any case, the aggregate number of vehicles in the carsharing fleet appears to be decidedly limited in relation to the number of vehicles registered for private use in Italy, which amount to about 38.5 million as anticipated in the last section. This is already a strong warning sign of the potential limited positive impact of carsharing for a more sustainable urban mobility.

Despite having limited fleets, carsharing services can offer a significant advantage in bringing higher electric penetration rates to the market compared to private cars. For instance, in Italy, around 27% of the total carsharing fleet comprised electric vehicles, compared to the 0.2% of private cars in 2021.

Carsharing fleet composition by fuel in Italy (2021)



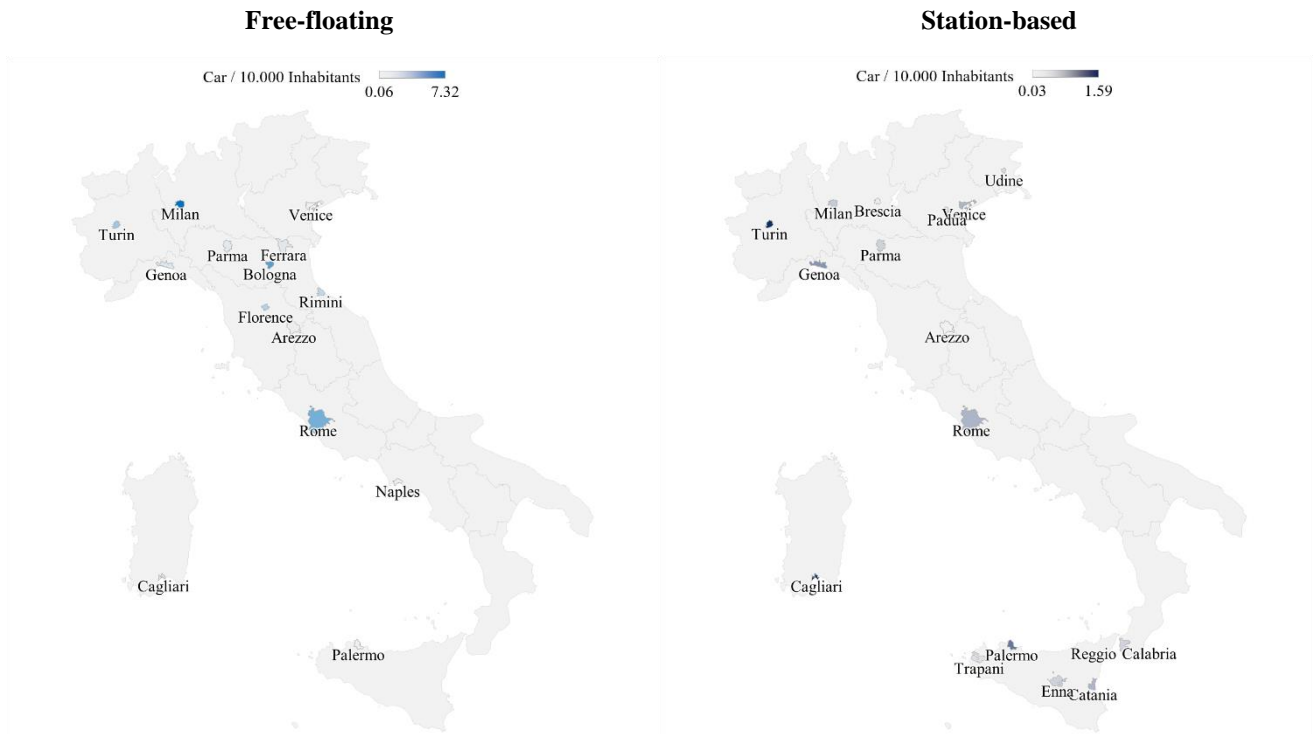
Source: Personal elaboration from OSM data

Analyzing the other figures, enrollments in carsharing services amounted to over 2 million, of which about 98% are in free-floating services. This percentage, which is also closely related to the number of vehicles in the fleet, is not a surprise, as by its nature free-floating is concentrated in cities with a higher population density and its economic sustainability is based on a large number of rentals over short distances. This fact is confirmed by the significantly higher turnover rate, measured by rides/car/day on average, amounting to 2.89 compared to the 0.65 of station-based. Conversely, rentals are on average higher in terms of kilometers traveled for station-based services (23.94 km/rental) than for free-floating (9.85 km/rental). The same applies for the duration of rides, that amounted to 44 minutes per ride on average for free-floating services and 3.3 hours/ride for the station based⁹¹.

⁹¹ OSM data

At the level of spatial distribution, free-floating carsharing continues to be a phenomenon linked to large cities in the central and northern regions.

Geographic distribution of carsharing in Italy (2021)



Source: Personal elaboration from OSM data

Free-floating services are mostly concentrated in five regional capital cities with high population density. Milan with 7.32 cars per 10,000 inhabitants remains the city with the highest supply of free-floating cars in Italy, followed by Bologna (4.63), Rome (3.78), Turin (2.42) and Florence (1.88).

More uniform, on the other hand, is the territorial density of station-based carsharing in terms of cars per 10,000 inhabitants, thanks in part to the well-established experiences of regional carsharing in the north, such as the city of Turin with 1.49 vehicles per 10,000 inhabitants, and those on the islands, such as Cagliari (1.59) and Sicily, among which Palermo stands out among the most advanced with 0.93 cars per 10,000 inhabitants.

Mr. Ciuffini (OSM) addressed the uneven distribution of carsharing adoption rates across different regions in Italy, providing three reasons to explain the unevenness across the Italian territory.

Firstly, there is a strong relationship between willingness to pay and carsharing presence. In the south, incomes are lower, and therefore carsharing companies have less interest in doing business there.

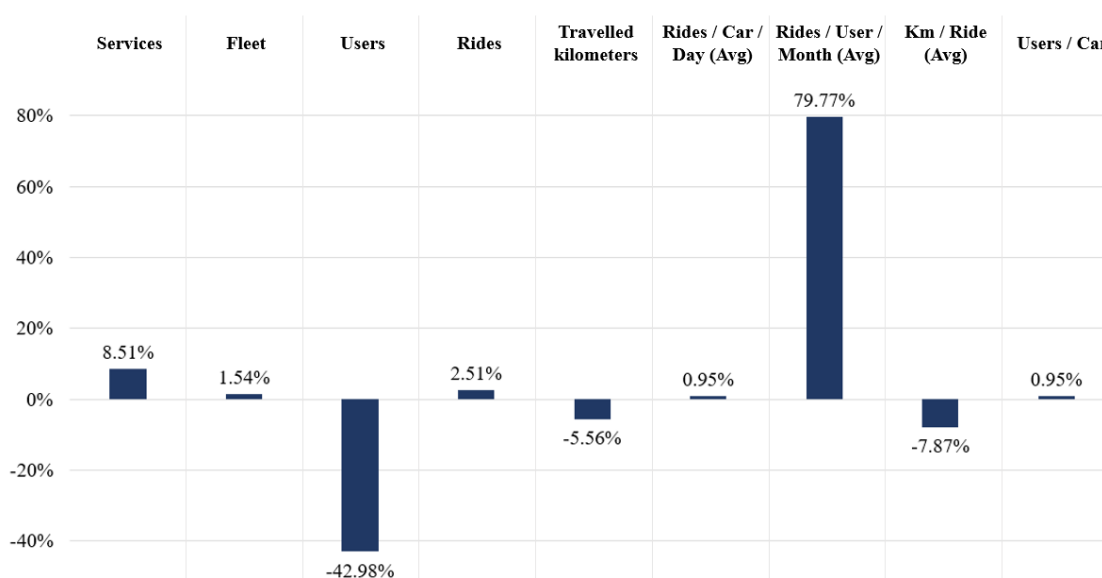
Secondly, the spatial conformation of a region plays a significant role in the success of carsharing services. Normally, in large cities, sharing services work better because there is a higher density. However, it is possible to find exceptions to this rule, such as in Palermo and Cagliari that both have station-based carsharing services.

Lastly, cultural factors also play a role in the unevenness of carsharing adoption rates. In the south, there is less consideration of carsharing compared to using one's own vehicle. A minimum predisposition to use a shared car versus one's own car is necessary. In the south, there is less use of local public transportation (LPT), because it works poorly, and thus there is more use of private vehicles than in north-central cities. The political/cultural factors related to sustainable mobility modes are few and scarce in the southern regions.

On the other hand, Mr. Ciuffini (OSM) highlighted the main success factors of cities such as Milan, Rome, and Bologna that have experienced high adoption rates of carsharing services, especially free-floating. These cities have a higher density, and therefore carsharing services, especially free-floating models, work better there. Furthermore, there is a higher willingness to pay, and people are more predisposed to use shared cars.

Moving on from a static analysis of the data for 2021, it is certainly important and noteworthy to go and analyze the compounded annual growth rate (CAGR) with respect to the various figures identified by dividing the two types of carsharing. This is a crucial step, as it provides a better look at the path that guided carsharing to its current stagnation. For this purpose, the period in scope for the analysis is 2018-2021. The analysis primarily focuses on station-based carsharing models, which generally exhibit a stagnant scenario without any significant growth or decline. However, taking a closer look at the numbers for the CAGR of this mode over the period from 2018 to 2021, two important figures emerge: a decrease in the number of users and sharp increase in the number of trips per person per month on average.

Station-based carsharing figures CAGR (2018-2021)

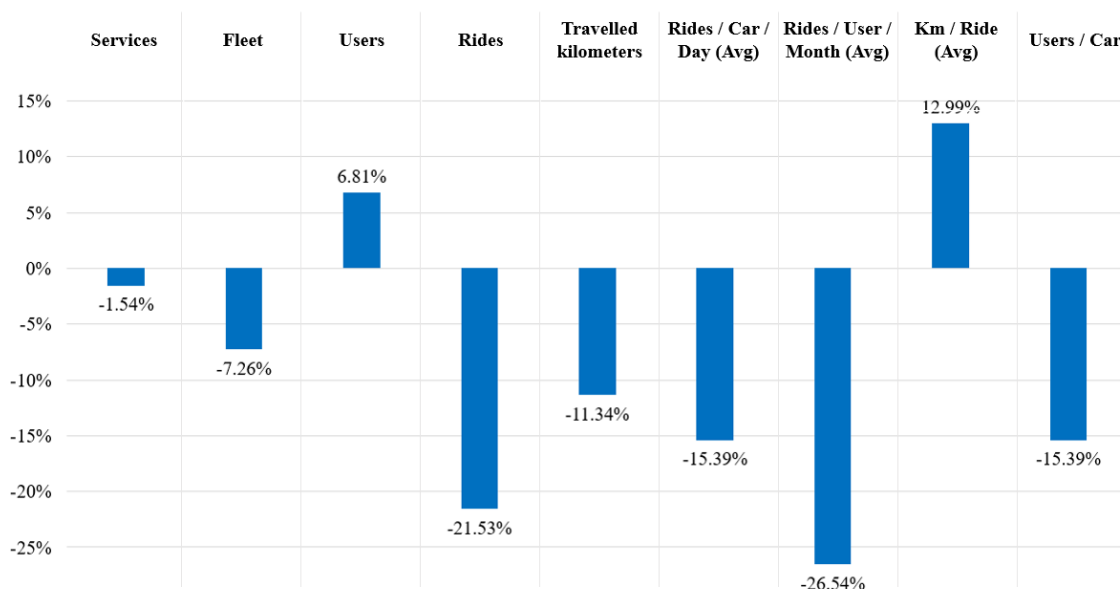


Source: Personal elaboration from OSM data

Since 2018, the number of users has sharply declined by almost 43% every year until 2021. This is a negative figure, showing a user base that is slowly moving away from this type of service. On the other hand, the users who have stayed have greatly increased the number of trips per month, even almost 80%

year by year until 2021. This shows how this type of service has been all in all resilient to the pandemic bracket. As for the other figures, they remain more or less stable over time. According to Mr. Ciuffini (OSM), station-based carsharing is typically publicly managed and receives a significant amount of public funding as a subsidy, which contributes to its stability even in times of crisis. As a result, there is no fleet collapse or demand collapse during such periods. The client base is also less volatile and generally made up of individuals who subscribe to the service from the start as a complement to their family's fleet. This usage is not linked to travel, tourism, or work, but rather to everyday life. Station-based carsharing tends to attract people who use the car for longer periods, as evidenced by higher mileage per number of rentals. On the other hand, the scenario for free-floating services resembles a “perfect storm”, as defined by Mr. Ciuffini. Free-floating carsharing has been struggling to recover its pre-pandemic levels in terms of fleet size, number of rentals, and mileage.

Free-floating carsharing figures CAGR (2018-2021)



Source: Personal elaboration from OSM data

The data show negative CAGRs for most figures: services, fleets, rentals, traveled kilometers, turnover rate, and trips per user per month. Data shows that not only has there been a downturn in the number of rides, but also a reduction in the number of vehicles available in fleets.

According to Mr. Ciuffini (OSM), the supply of cars might have been affected by the reshuffling of players in the market, as companies like Daimler and BMW have exited the carsharing business, leaving a shortage of cars. Daimler and BMW have left their carsharing business to Stellantis Group, that acquired Share Now, the joint venture between the two companies, to strengthen its own carsharing brand, Free2move⁹².

Mr. Ciuffini (OSM) adds that this problem has been compounded by the global microchip shortage and the closing of Asian supply chains due to Covid-19 pandemic, which have made it difficult for automakers to

⁹² Il Sole 24 ORE (2022). Stellantis acquisisce Share Now, società di carsharing di Mercedes e Bmw. Available online: [Link](#)

keep up with the demand for cars. The global chip shortage that has been affecting the automotive industry since 2021 shows no signs of easing, with experts forecasting a potential loss of 2-3 million units of already planned production in 2023⁹³. This crisis started during the COVID-19 pandemic when demand for work-from-home technology increased, and automakers competed for semiconductor capacity in Asian foundries. The shortage caused production delays and sales declines in the auto industry. The COVID-19 Delta variant exacerbated the problem by causing bottlenecks in the supply chain, particularly in downstream operations in South and Southeast Asia. Structural factors were also part of the problem, with the auto industry shifting toward automation and electric vehicles, which require even more chips. Chip suppliers reported high semiconductor lead times due to high demand and production difficulties caused by several factors, including extreme weather and fires, causing low supply. This shortage caused significant disruptions to production, resulting in reduced availability of new cars for consumers. As a result, the delivery times for new vehicles have also been significantly impacted, with some customers waiting months to receive their orders. This has had a knock-on effect on carsharing businesses, which rely on a steady supply of new vehicles to replenish their fleets. With production cuts likely to continue into 2023, delivery times for new cars are also expected to remain long, posing a challenge for both car manufacturers and carsharing companies alike.

For free-floating models, the demand for the service has also declined. According to Mr. Ciuffini (OSM) it is most likely due to a reduction in the number of city users (e.g. business travelers) who used to rent cars frequently, the development of smart working and the decrease in tourism. Particularly critical is the figure of about -27% with respect to the number of trips per user per month, demonstrating a decreasing utilization of the service over time. Against this backdrop, however, two promising figures emerge: the increase in the user base and the steady increase in average trips per rental. With respect to kilometers traveled per trip, a positive 13% increase year over year from 2018 to 2021 emerges from a less-than-proportional decrease in travelled kilometers to number of rentals. This is an element of resilience and resembles a trend that started before 2020 and the opening of a new market segment for carsharing. In fact, in response to the decreasing customer base, carsharing companies have been trying to target customers who rent cars for longer periods, such as half-day or weekend rentals. Consequently, most carsharing services are now targeting a specific mobility segment, addressing the demand for longer rental options, and putting themselves in direct competition with rental companies.

Lastly, Mr. Ciuffini from OSM emphasized the challenge of profitability associated with carsharing services, which often remains low and, in certain instances, even negative. He explained that the sector initially aspired to play a significant role in urban mobility but encountered subsequent challenges that exacerbated the situation. The accounts got worse, resulting in less investment, closed positions and

⁹³ J.P. Morgan (2022). How to begin building a credit history. Available online: [Link](#)

problems with maintainers. This negative cascade has affected most operators, causing the entire industry to stagnate.

3.2.2 The role of local administrations

In Italy, the establishment and promotion of shared mobility services require the active involvement of local administrations, that play a crucial role in shaping the general regulatory framework and creating favorable conditions for the establishment and development of all shared mobility services, carsharing included⁹⁴.

To ensure that carsharing models and solutions are aligned with a city's strategic sustainable mobility objectives, it is critical to identify the objectives to be achieved, expected results, and the timeframe for achieving them. This step is vital not only for internal coherence but also because it determines all the administrative acts to be taken by the local government once the service planning phase is completed, and the service characteristics are defined. Therefore, objectives are frequently included in local planning tools such as the Sustainable Urban Mobility Plan (SUMP)⁹⁵.

SUMPs should be aimed at shaping an urban mobility system that improves accessibility for all, enhances the quality of life and attractiveness of the urban environment, improves road safety and public health, reduces air and noise pollution, greenhouse gas emissions, and energy consumption, and promotes economic viability, social equity, and environmental quality⁹⁶. Each city is responsible for drafting the SUMP circumscribed to its territory, following the national guidelines that have been prepared by the Italian Ministry of Infrastructure and Transport (MIT) based on the inputs received from the EU.

According to the European guidelines, identifying the objectives means making explicit the aspects of the current urban mobility set-up intended to be improved through the SUMP and specifying the direction of the improvement pursued by indicating what is intended to be reduced or increased. The Italian guidelines provide that these objectives are articulated in a framework consisting of 17 mandatory minimum macro-objectives and other additional and specific macro-objectives if the city municipality deems it necessary. The 17 mandatory minimum macro-objectives respond to four general areas of interest: effectiveness and efficiency of the mobility system, energy and environmental sustainability, safety of road mobility, and socio-economic sustainability⁹⁷.

⁹⁴ Fondazione per lo sviluppo sostenibile et al. (2020), p. 118-120

⁹⁵ Fondazione per lo sviluppo sostenibile et al. (2020), p. 143

⁹⁶ MIMS (2022). Vademecum per la redazione del piano urbano di mobilità sostenibile (SUMP). Available online: [Link](#)

⁹⁷ Ibid

Areas of interest	PUMS macro-objectives
A) Effectiveness and efficiency of the mobility system	A1 Improvement of local public transport
	A2 Shifting the modal balance of mobility
	A3 Reduction of traffic congestion
	A4 Improving the accessibility of people and goods
	A5 Improving integration between the development of the mobility system and spatial planning and development
	A6 Improving the quality of road and urban space
B) Energy and environmental sustainability	B1 Reduction in consumption of conventional fuels other than alternative fuels
	B2 Improving air quality
	B3 Reduction of noise pollution
C) Safety of road mobility	C1 Reduction of road accidents
	C2 Significant decrease in the general number of deaths and injuries
	C3 Reduction of social costs resulting from accidents
	C4 Significant decrease in the number of deaths and injuries among weak users (pedestrians, cyclists, children and over 65)
D) Socio-economic sustainability	D1 Improving social inclusion
	D2 Increasing citizenship satisfaction
	D3 Increasing the employment rate
	D4 Reduction of mobility costs related to the need to use a private vehicle

Source: Personal elaboration from SUMP Vademecum

To ensure the achievement of each goal, municipalities must identify measurable and feasible targets. Even if SUMP include targets related to sustainability that generally focus on reducing emissions, energy consumption, air pollution, and improving accessibility, carsharing is not a specific target. However, as denoted by Mr. Ciuffini, the achievement of these objectives is linked to a combination of several measures, and carsharing is one of them even if not explicitly mentioned.

In addition to formulating the SUMP, local administrations are responsible for establishing the regulatory framework that carsharing operators must adhere to by means of municipal deliberations. Minimum requirements for fleet composition and service standards, concessions and per-car fees are imposed by administrators to carsharing operators. To provide concrete examples of the “frames” set by municipalities, the deliberations of the five most important Italian cities for free-floating services (Rome, Milan, Turin, Bologna, Florence) are reported in the appendix.

Mr. Volpe, coordinator of the “*Agenzia Roma Servizi per la Mobilità*” provided insights on how the local carsharing market of Rome is managed by the agency. The agency works closely with Roma Capitale to draft the “frame” and establish operating parameters aimed at reducing the use of private vehicles. Moreover, the agency monitors private carsharing operators’ activities to ensure they meet minimum requirements set by Roma Capitale and is responsible for activating penalizing levers when necessary. Specifically, carsharing rides, available cars in the fleets and those not rentable due to maintenance issues, total number of vehicles on the road are monitored. In the specific case of Rome, carsharing operators who do not meet the new guidelines must change their set-up within 365 days or risk losing their license.

Moreover, the municipality of Rome designed per-car fees which are set to zero for electric vehicles in fleets – to push electrification – and linked to the operating area of the service for traditional ICE and hybrid

cars. The larger the operational area covered by the operator, the lower the fee to be paid to the municipality. The objective behind this policy is to incentivize carsharing operators to expand their services in the suburbs by increasing the minimum operating area, promoting a wider coverage of carsharing services beyond the city center and into the outskirts of Rome.

In conclusion, municipalities play a crucial role as enabling stakeholders in the Italian carsharing industry, as operators must adhere to the regulations and requirements established by them which can have both favorable and unfavorable conditions for the operators.

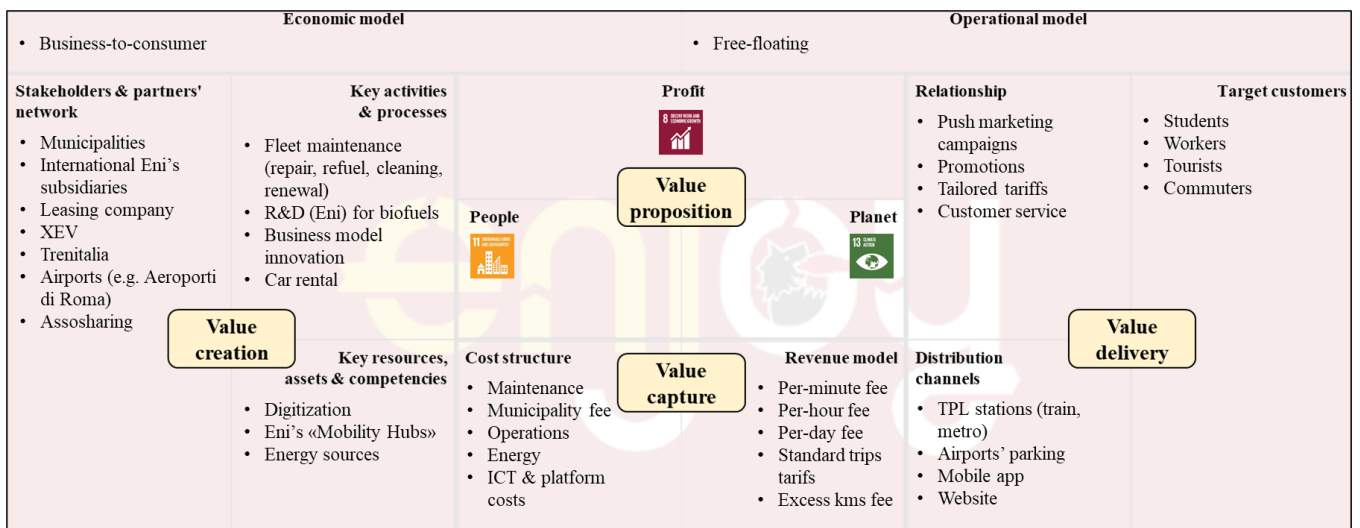
4. EVIDENCE FROM MULTIPLE CASES

This chapter presents the results obtained from the semi-structured interviews conducted with selected Italian carsharing operators and OSM. The first question addressed to operators focuses on their potential contribution to the SDGs. To aid the respondents, the interview protocol incorporates the SUMP macro objectives as benchmarks to facilitate the alignment of operators' responses with the SDGs, particularly in instances where companies have not previously established a direct correlation. Second and third questions explore value dynamics: enabling factors that foster value creation and delivery, and challenges afflicting value capture. A Business Model Canvas⁹⁸ is presented for every carsharing operator in the first sample. OSM's contribution was partially reported in the industry overview, whereas in this section will be focused on exploring its perspective on carsharing's potential contribution to the SDGs and the necessary conditions for this service to effectively pursue them. Interview guidelines are provided in the appendix.

4.1 Enjoy

Enjoy, the carsharing service of Eni, was established 10 years ago in 2013 as a startup within a company primarily focused on selling gasoline and diesel. This made Enjoy somewhat of an anomaly within the system. From the beginning, Enjoy aimed to establish its unique brand identity with its iconic red Fiat 500 model. Over the years, Enjoy has expanded its carsharing operations to five cities (Rome, Milan, Turin, Bologna, Florence) with some experimental endeavors like Piaggio scooters and expansion in Catania that didn't pan out. The startup culture still characterizes Enjoy identity, even within a larger company.

Enjoy Business Model Canvas



Source: Personal elaboration

Massimo Rovatti, Head of Smart Mobility at Eni and coordinator of its carsharing service, Enjoy, was interviewed.

⁹⁸ Osterwalder, A., & Pigneur, Y. (2010)

4.1.1 Potential contribution to SDGs

Enjoy aims to establish intermodal connections with airports and stations, addressing the last-mile transportation gap and enhancing convenience and accessibility for users, reducing traffic congestion for optimized road space utilization. The latter is a central issue in most Italian cities as “...[they] are huge parking lots... if one were to line up the cars that are parked in Milan, you get to Copenhagen”. In cities like Rome, where the number of parked cars exceeds the population, carsharing models like Enjoy come into play: “...rather than each individual using a private car that remains idle for most of the day, Enjoy enables multiple people to share a single vehicle, thereby alleviating congestion”. Therefore, Eni aims through its carsharing service to contribute to:



- **11.2** | Provide access to... sustainable transport systems for all...

Enjoy always prioritizes its pricing strategy, constantly striving to create customized offerings meeting the different needs of its users and enhance the affordability of their carsharing service. One of Enjoy's notable approaches is the development of special daily offers specifically designed for weekend and holiday rentals. These packages not only provide added convenience but also include the cost of gasoline, significantly enhancing the overall affordability of adopting Enjoy's mobility solution. By promoting adoption to its carsharing service, Eni maximizes the trips that can be made through the minimization of means, the car, that is shared. This potentially leads to an improved efficiency in the "consumption" of a mobility service, which allows Eni with Enjoy to align with:



- **8.4** | Improve progressively global resource efficiency in consumption...

Eni with Enjoy strives to deploy a mobility solution that contributes to the reduction of exhaust emissions by integrating hybrid and electric vehicles into their fleet. As part of its comprehensive sustainability approach, Eni considers the entire lifecycle of vehicles and evaluates the well-to-wheel⁹⁹ environmental impact of their carsharing service. Moreover, Eni actively engages in R&D activities to introduce the latest technology and fuel solutions to decrease such impact. In fact, while electric cars effectively eliminate exhaust emissions, it is important to recognize that the overall environmental impact also relies on the energy sources used to generate electricity, known as scope 3 emissions. By aiming for reduced exhaust emissions, Enjoy's environmental goals align with:



- **13.1** | Strengthen resilience and adaptive capacity to climate-related hazards...

⁹⁹ A well-to-wheel evaluation impact assesses the total environmental and energy efficiency performance of a fuel or energy source for transportation by considering its entire life cycle, from extraction/production to end use in vehicles.

4.1.2 Enabling value creation and delivery elements and external factors

Stakeholders and partners' network: Agreements with major transportation companies ensure reserved parking spaces to Enjoy in strategic locations, such as train stations or airports. Agreements are also made with municipalities to obtain licenses for reserved parking areas in strategic points and for granted access to Low Traffic Zones (LTZs). Both services are included in Enjoy's fee. In this way, Enjoy creates value for consumers promoting ease of access and convenience to its carsharing service.

Additionally, the company is active in the industry trade association, "Assosharing", seeking to influence government policies and regulations impacting carsharing services. One of the initiatives pursued by the association is advocating for a reduction in value-added tax (VAT) rates for carsharing, aligning it with the rates applied to local public transport (LPT), incentivized by the Italian government. With lower taxation Enjoy would have the opportunity either to allocate more resources to services' expansion or lowering its fees, thereby creating more value for customers in the form of greater economic convenience.

XEV supplies Enjoy with "YOYO" electric car models, introducing an innovative technology called "battery swapping" to the market. With this technology, flat batteries can be easily swapped for fully charged ones at ENI Live stations, canceling out lengthy charging times thus increasing the availability of cars -immediately ready for use after the swap. Moreover, batteries are slowly recharged at stations, extending their lifecycle.

Key activities and processes: Enjoy's differentiation strategy centers around business model innovation. First, as discussed above, the introduction of battery swapping for electric cars. Second, the option to refuel traditional ICE and hybrid cars themselves, receiving a monetary reward as a "premium" for their support. This approach not only benefits customers but also addresses logistical challenges associated with car refueling, creating a mutually beneficial arrangement.

Key resources, assets & competencies: Enjoy strategically capitalizes on synergies with Eni by leveraging their extensive network of 6,000 Live stations, which serve as mobility hubs. This advantage enables Enjoy to conveniently refuel/recharge and wash vehicles, perform battery swaps, and allows customers to access cars directly from these locations, creating unique value.

Distribution channels: Strategic contact points with dedicated parking spaces, such as airports and train stations, are key to Enjoy's distribution channels (e.g. Fiumicino Airport and Milan airports and major stations like Roma Termini). With dedicated parking spaces near hubs, Enjoy offers a seamless experience and provides convenience for users: *"...business users find this parking solution highly convenient and cost-effective, making it a preferred choice over other transportation options, including taxis"*.

Shift towards medium-term rentals (external factor): Enjoy capitalizes on the new market segment that demands medium-term rentals (see industry overview). Enjoy is driving this transition prompting users with their daily rental option displayed on their cars: *"...by offering a competitive package*

of 49€, 150km and fuel included, we entice potential users to download the app and take advantage of this convenient offer". The development of this new market segment is most likely due to a shift in consumer preference, which opens up opportunities for Enjoy to deliver more value by offering tailored longer-term rental options that meet this new market segment's demand.

4.1.3 Challenges in value capture dynamics

Car logistics management: In free-floating carsharing models, a phenomenon commonly observed and confirmed by the respondent is the centrifugal movement of cars from day to night. Enjoy frequently observes intervals where there are fewer vehicles available in the city center, as they tend to be relocated outward. To ensure the availability of the cars, Enjoy dedicates considerable effort and resources to repositioning them across the served area. Enjoy's profitability is closely linked to the movement of cars. If technical downtime occurs or cars need to be repositioned, refueled or recharged, Enjoy incurs high cost opportunities thus hindering the value that it can capture back from activities. Therefore, maximizing car utilization and reducing idle time are essential key performance indicators (KPIs) for achieving economic sustainability: "*...the more cars are moved, the fewer cars I make drive around, the more money Enjoy makes*", it is a virtuous circle.

Vandalism and abuse of vehicles: vandalism poses a significant challenge for Enjoy, resulting in costly repairs and deductible payments. Additionally, user behavior can impact vehicle conditions. Enjoy mitigates these issues through regular cleaning and maintenance practices, albeit increasing operating costs.

Poor density and number of cars in the fleet and low area coverage: to have a significant and positive influence on urban mobility in large cities, a substantial fleet is required: "*...in a city like Rome, a fleet of 20,000 carsharing vehicles would be necessary to make a substantial impact, whereas we only have fewer than 400*". Currently, Enjoy's coverage is limited to a small fraction of the population in its operating cities, approximately 5%, indicating significant room for expansion. Ensuring convenient access to nearby shared vehicles is vital to prevent users from resorting to private cars as an alternative. Meeting existing demand that remains untapped due to limited vehicles' availability would also maximize potential revenues.

Different cities and needs require different strategies: Enjoy underlines each city they serve stands as a unique business entity, requiring distinct organizational structures and strategies to meet their specific characteristics. Milan, with its vibrant and dynamic environment, thrives on free-floating services, making it an ideal setting for short-distance rentals. Rome has shown a strong preference for daily usage, especially among commuters traveling to and from the outskirts of the city. Bologna's strong university presence calls for targeted promotions to students, while Florence's excellent bike infrastructure enables intermodality with alternative transportation options. In Turin, a hybrid scenario emerges, with a growing interest in both free-floating and electric options, although the city is still undergoing transformation. These

differences highlight the need for tailored approaches in each city thus hindering the possibility for Enjoy to standardize approaches to lower costs.

Consumers' range anxiety in the use of electric vehicles for longer trips: Enjoy offers the YOYO car models within the city boundaries, as full electric options are currently limited to urban transport to ensure users do not experience range anxiety. However, for longer trips, hybrids are more suitable to alleviate range concerns. Traveling out of town with electric vehicles requires planning and is perceived as a barrier, thus hindering value capture from the demand that remains unsatisfied.

Price is perceived as a barrier to adoption by consumers: The current fees are often perceived as expensive, becoming a barrier to wider adoption. Enjoy actively seeks ways to reduce costs and increase revenue to address this issue, aiming to strike the right balance in fare offerings that align with consumer demand and affordability expectations.

Development of micromobility: the Covid-19 pandemic has led to a change in consumer preferences regarding shared transportation for short distances, with micromobility options becoming a preferred choice due to their outdoor nature and concerns about contagion. This presented a challenge for carsharing operators, who had to address new market opportunities such as daily or longer-term rentals.

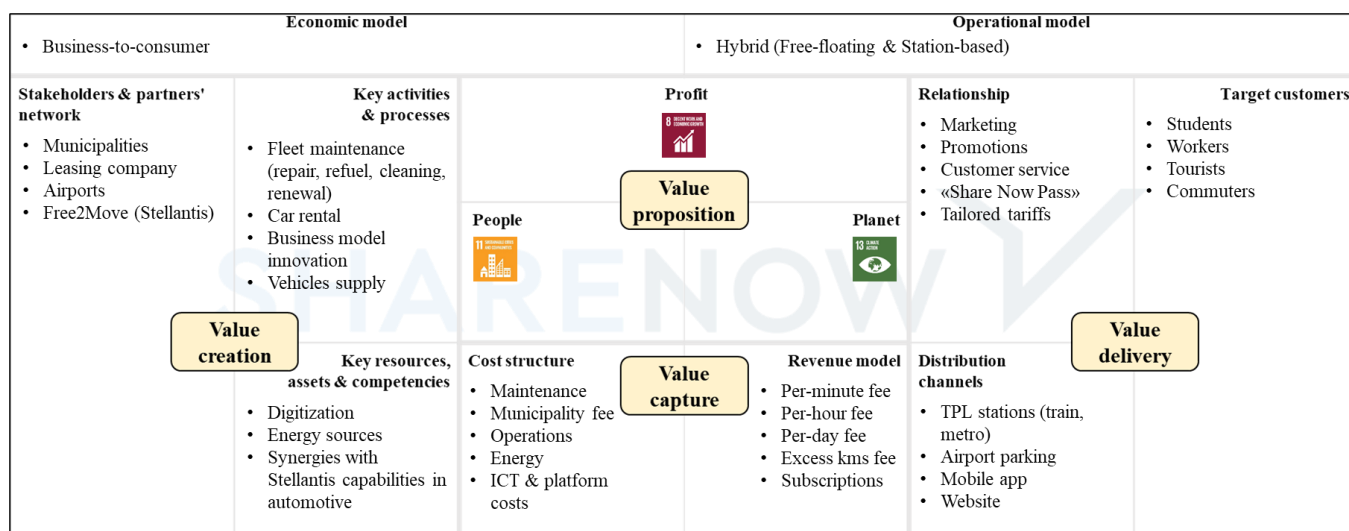
Municipalities do not consider carsharing par to other alternatives to private car, imposing fees: Enjoy faces a challenge due to government bias that hampers the recognition and support (subsidies and assistance) given to carsharing compared to other alternative mobility modes, such as LPT. Enjoy, like all the other carsharing operators, has to bear additional costs in the form of per-car fees imposed by most municipalities, despite the similar nature of carsharing to public transportation, which is conversely exempt from any fees. The interviewee added that: *"...the municipality of Rome has shown a more favorable approach through dialogue and a resolution that allows for optimization of square kilometers to reduce fees. In contrast, other municipalities, such as Milan, charge indiscriminately"*. This causes an increase in operating costs that severely affect the profitability of the overall business, reducing its margins. Often, municipalities expect carsharing operators to serve low-demand suburban regions, but this unequal treatment creates obstacles for Enjoy's expansion as leading to underutilized vehicles and reduced economic sustainability. To overcome these limitations, the interviewee suggests that *"...if carsharing were considered par to the local public transport system at least in the suburbs, thus provided with incentives at lower taxation, carsharing operators could expand their operating area there"*. By acknowledging the value of carsharing and offering equal opportunities and incentives, the government can foster an inclusive and sustainable transportation ecosystem.

4.2 Share Now

Share Now first emerged from the merger in 2019 of Car2Go and DriveNow, previously owned respectively by Mercedes-Benz Mobility AG and BMW Group. In 2022, the company was acquired by Free2move, a

subsidiary of Stellantis. These strategic acquisitions led Share Now nowadays to fully operate in 8 countries in Europe, specifically in 16 European cities, thus gaining an international reputation and providing a comprehensive and distinctive ecosystem for both individual and corporate customers globally. It is predominantly a free-floating carsharing service, but in some areas Share Now has dedicated parking lots that assimilate the service to a station-based one, turning the business into a hybrid configuration. In Italy, Share Now is operating in Rome, Milan and Turin where predominantly opted for an endothermic fleet; only Milan is an exception where they have approximately 100 electric vehicles.

Share Now Business Model Canvas



Source: Personal elaboration

The respondent, Luigi Licchelli, is Head of Business Development and Public Affairs of the company as well as carsharing coordinator in Assosharing, the Italian industry trade association of sharing mobility.

4.2.1 Potential contribution to SDGs

First, Share Now promotes efficient use of urban space through the effect of reducing private car ownership. The company supports this claim by leveraging the multiple studies that have been done in academia. In particular, the respondent cited a study on the impact of free-floating carsharing on car ownership in 11 European cities, Rome included, by the Institute of Technology¹⁰⁰.

Through a statistical regression analysis, this study revealed a single carsharing vehicle can replace up to 20 private cars in optimistic scenarios. Copenhagen, Rome, Hamburg, and London had the highest number of private cars replaced, while Madrid had the lowest. The frequency of carsharing service usage was the primary factor influencing the decision to give up a private car. Users who drove more kilometers with shared cars were more likely to sell their private vehicle or rely more on the carsharing service. Additional memberships in bikesharing and other carsharing services, living in larger buildings, and owning multiple

¹⁰⁰ Jochem, P., Frankenhauser, D., Ewald, L., Ensslen, A., & Fromm, H. (2020). Does free-floating carsharing reduce private vehicle ownership? The case of SHARE NOW in European cities. *Transportation Research Part A-policy and Practice*, 141, 373–395. <https://doi.org/10.1016/j.tra.2020.09.016>

cars also increased the likelihood of reducing the number of private vehicles. This would bring benefits also in terms of reduced streets' congestion and more free space for citizens and commercial activities.

The respondent further corroborated his claims, citing directly: “...a private car generally stays parked about 95% of its life... another study by Fleet&Mobility Study Center¹⁰¹ on the city of Rome demonstrated that a fleet of 20,000 shared cars would take almost 220,000 private cars off the roads”.

By reducing car ownership, Share Now aims to decrease traffic congestion and improve road space.

Moreover, Share Now provides consumers with options that connect different modes of transportation alternatives to private cars, by taking advantage of reserved parking spaces in strategic locations such as airports and train stations. Carsharing complements public transportation where it cannot reach.

For these considerations, Share Now aligns with:



- **11.2** | Provide access to... sustainable transport systems for all...

Second, the previous study further illustrates that such car ownership reduction in Rome would bring a reduction in emissions of 83 tons/year of PM10 (-10% from the current figure).

In addition, Share Now leverages its flexible rental contracts to periodically renew its fleet, always favoring Euro 6 vehicles with lower emission standards. Through car ownership reduction effect, Share Now can replace older and less eco-friendly cars with a newer and lower-emission fleet, aligning with:



- **13.1** | Strengthen resilience and adaptive capacity to climate-related hazards...

Finally, the interviewee claimed that Share Now, compared to traditional car rental, offers highly competitive and tailor-made rates, ranging from minute fees to long-term rentals. Carsharing also frees consumers from the financial burdens associated with car ownership such as road tax, insurance, inspections, tire changes, parking fees and, most importantly, fuel costs. It also eliminates non-driving costs, as consumers only pay when they actually drive. Directly citing the interviewee: “...the cost of a car is one of the main items of expenditure for a person ... consumers have a car that is always new, euro 6, clean, refueled and ready for use”. Aiming at reducing mobility costs for consumers and improving efficiency in consumption of mobility services, Share Now potentially contributes to:



- **8.4** | Improve progressively global resource efficiency in consumption...

4.2.2 Enabling value creation and delivery elements and external factors

Stakeholders and partners' network: Mr. Licchelli, representing the trade association Assosharing, emphasized the significance of their initiatives in supporting Italian carsharing operators,

¹⁰¹ Fleet&Mobility. (2021). Il car sharing e la sua vera funzione. Available online: [Link](#)

positioning the association as a key stakeholder. One notable initiative is the request for a reduction in VAT for carsharing services from 22% to 10%, aligning it with LPT. This proposal, if passed, would enable lower fees and help accelerate the profitability of carsharing services thus fostering greater investments for a more sustainable urban mobility.

Key Activities and Processes: business model innovation plays a pivotal role for Share Now, e.g. algorithms powered by artificial intelligence were introduced to support complex decision-making in operations management, as well as in marketing analyses. The selection process of vehicles to include in their fleet is crucial as Share Now has decided not to fully electrify its fleet due to complexities associated with its management. Thanks to the flexibility of rental contracts, it has introduced compact and SUV cars with ICE engines to meet the evolving demands of customers seeking longer rentals and avoid range anxiety issues.

Key Resources, Assets, and Competencies: Following the recent acquisition of the company by Stellantis with Free2Move, the company benefits from synergies corporate capabilities, facilitating access to Stellantis vehicles at favorable prices, leveraging the expertise and resources of the larger automotive group.

Customer relationships: Share Now offers wide-ranging rental options to meet the diverse consumers' needs, e.g. in response to the growing demand for longer rental periods, in 2019 the company introduced longer-term rental options up to 30 days allowing customers to benefit discounted fees. It also offers credits to reward loyalty and a subscription model, "Share Now Pass", designed to save costs for frequent travelers. Marketing communications promoting sharing mindset to consumers supported the company to make a difference in how people perceive and engage with mobility options since 2013. They try to integrate sharing and environmental responsibility to foster a sense of community and change perceptions of mobility.

Distribution Channels: Strategic contact points with dedicated parking spaces, located in airports, train stations, and major transportation hubs, are key for Share Now. They secure agreements with both public and private entities to provide users with convenient options alternative to personal vehicles. The company continuously tries to increase these contact points to make the service more and more accessible.

Development of Mobility-as-a-Service: the advancement of Mobility as a Service (MaaS) in Italy, with the project "MaaS4Italy" (see next chapter), represents a significant stride in the field of mobility, as it aims to consolidate various alternative mobility options into a single platform, thereby reducing the reliance on private car ownership. However, the interviewee expressed concerns regarding the potential drawbacks of MaaS as it could end up in profit cannibalization and a loss of bargaining power, thus making it crucial to carefully consider the balance between achieving integration and safeguarding the interests of shared mobility services.

4.2.3 Challenges in value capture dynamics

Limited fleet dimension: large fleets are needed to have a significant impact and reach a mass level of service. Currently, Share Now does not operate at its full potential in Italy, due to a limited fleet and an unfavorable regulatory environment: “...there is already an initial impact in Italian cities, but it could grow much more if there were those, let's say, conditions for us to invest more and more resources to expand our fleets and be more impactful”. According to Mr. Licchelli, this limitation is partly due to the lack of sensitivity and vision from some municipal administrations, who often view carsharing as ancillary rather than a fundamental transportation solution. The absence of favorable regulatory conditions further impedes fleet expansion and the ability to serve suburban areas, hindering value capture dynamics.

Car delivery crisis: Share Now has been impacted by the global car delivery crisis, exacerbated by the pandemic and the shortage of semiconductors and microchips (see industry overview). The crisis resulted in significant delays in receiving new vehicles for fleets. Extended waiting periods, up to two years, deeply affected expansion plans, fleet growth, and ability to meet customer demand.

Limited dedicated parking spots and imposed per-car fees by municipalities: an inadequate number of dedicated parking slots provided by municipalities for carsharing services afflicts the effectiveness of Share Now in integrating with public transportation services thus challenging the accessibility of the service. Moreover, Share Now, like all the other operators, have to bear additional costs in the form of per-car fees imposed by municipalities.

Imposed electrification and lack of recharging infrastructures: most municipalities mandate the electrification of carsharing fleets without considering market timing and technological limitations. The requirement to transition to all-electric vehicles overlooks the fact that significant technological advancements and infrastructure improvements are necessary to support long-range electric cars. Additionally, the aforementioned financial constraints make it difficult to invest in new technologies and comply.

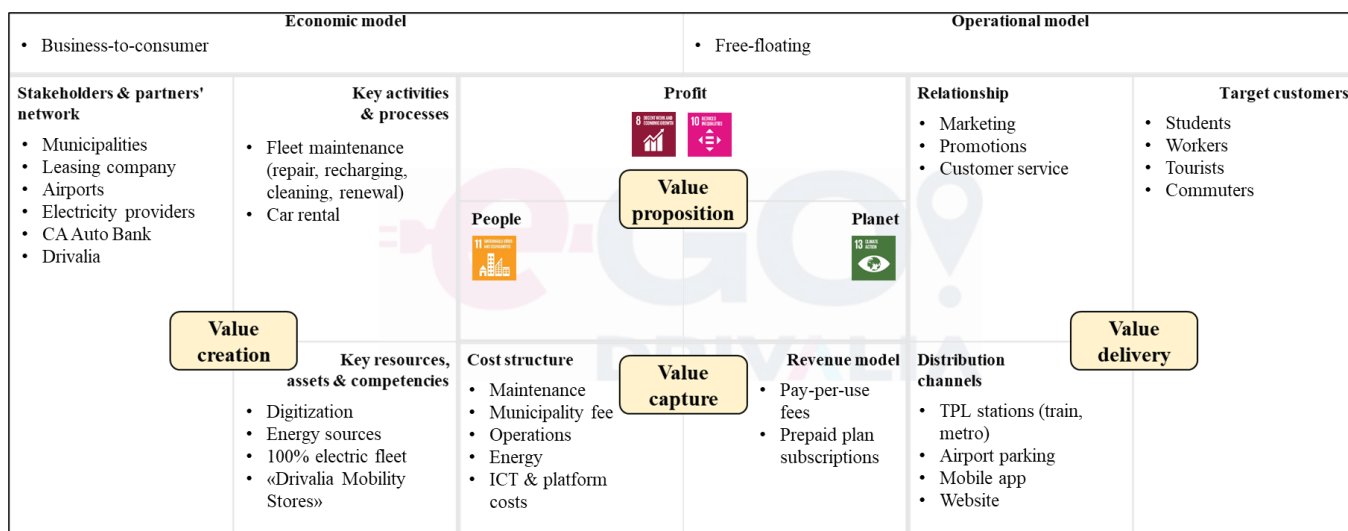
Scarce evidence of disincentive policies to reduce car ownership: during the pandemic, there were temporary measures implemented by administrations, such as the suspension of restricted zones and parking fees, which unintentionally encouraged people to rely more on private vehicles rather than shared or public transportation. These measures, intended initially to address urgent needs and facilitate movement during the pandemic, lasted for an extended period in some cities, reinforcing the habit of using private cars, disincentivizing alternative mobility services like carsharing.

4.3 e-Go! Drivalia

E-Go! Drivalia picks up the baton of LeasysGo!, the former carsharing model of FCA Bank, following the rebranding from Leasys to Drivalia, which terminated in April 2023 with the company's passage into the hands of Crèdit Agricole Auto Bank. Through Drivalia, the group's rental and mobility company, the bank

offers a full range of mobility solutions, from innovative car subscriptions through rentals of all durations to carsharing. Drivalia's new free-floating carsharing is 100% electric, operating in the cities of Turin, Milan and Rome, providing a fleet of more than 1,000 new electric Fiat 500s. The acquisition of BlueTorino, the carsharing business of the Bolloré Group in Turin, including all its EV charging stations, in 2020 has played a vital role in advancing Drivalia's mission to revolutionize sustainable mobility, significantly expanding its reach and capabilities.

e-GO! Drivalia Business Model Canvas



Source: Personal elaboration

The interviewee is a Carsharing Manager in Drivalia.

4.3.1 Potential contribution to SDGs

First, e-GO! Drivalia's 100% electric fleet contributes to improving the air quality of cities by reducing exhaust emission by offering only electric vehicles in their fleet, thus helping to mitigate air pollution and contributing to create cleaner and healthier urban environments. As so, the company aligns with:



- **13.1** | Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters

The company aims to reduce mobility costs for individuals through tailored pricing strategies, as they offer electric vehicles at competitive pay-per-use rates. Their pricing includes diverse services such as maintenance, cleaning, and insurance. Despite the higher initial cost of electric vehicles, Drivalia ensures that their pricing remains comparable to other operators using ICE vehicles, making its carsharing service more affordable and accessible to everyone. Promoting efficient use of shared electric shared vehicles and granting affordability of the service, Drivalia potentially contributes to two relevant SDG targets:



- **8.4** | Improve progressively global resource efficiency in consumption...



- **10.3** | Ensure equal opportunity...

Finally, the interviewee stated that the emergence of micromobility services does not have a negative impact on Drivalia's business but rather it complements their service, contributing to a more efficient mobility ecosystem. Drivalia fosters the integration with other businesses that offer alternative transport services to private mobility, such as bikesharing, scootersharing and LPT, placing its carsharing service as a complementary solution for transportation needs to address the issue of traffic congestion and optimize road space. Thus, e-GO! Drivalia, seeking to integrate harmoniously with an "ecosystem" of shared mobility services aligns with:



- **11.2** | Provide access to... sustainable transport systems for all...

However, the respondent suggested that efforts by the governments are needed to enhance regulations for shared modalities and ensure better coordination among these modes to achieve maximum benefits in terms of reduced congestion and better streets' viability.

4.3.2 Enabling value creation and delivery elements and external factors

Stakeholders and partners' network: efficient and cost-effective business operations are contingent upon establishing robust agreements with electricity providers, enabling the business to use contracted energy for recharging its electric fleet at favorable prices. By leveraging the network infrastructures for the majority of recharging activities, the Company tries to lower its operating costs. Furthermore, the company benefits from its corporate status in Stellantis, securing rental contracts with favorable conditions for its fleet and further lowering operating costs.

Key resources, assets, and competencies: Drivalia's carsharing benefits from charging stations guaranteed by the corporate group, the "Drivalia Mobility Stores", which serve both as commercial physical locations, where customers are assisted by knowledgeable consultants to choose among multiple mobility options including short-term, medium-term, and long-term rentals, but also for recharging cars in the fleets and granting parking for customers. As consumers use the stores' parking lots, Drivalia is able to minimize unnecessary relocations of vehicles for charging purposes which are detrimental for the business as it: *"...makes money when customers use our cars, not when they are charging"*.

Development of MaaS: The development of MaaS is seen by the interviewee as a positive external factor for Drivalia. As municipalities are increasingly focused on sustainable mobility, MaaS aims at integrating various mobility services to reduce private car ownership. The "MaaS4Italy" project aims to provide a single entry point for integrated mobility services, including LPT, trains, buses, and more. This initiative encourages alternatives to private mobility, carsharing included, and offers the best transportation options for individuals to reach their destinations efficiently and in a more sustainable way.

4.3.3 Challenges in value capture dynamics

Scarcity of cars in the fleet and poor integration with LPT: the potential impact of e-Go! Drivalia in the city of Rome is: “...somewhat constrained by the low population density and the relatively small size of the fleet... where the public transportation system is often perceived as inefficient compared to that of Milan, where multiple options are available”. Unlike Milan, Rome lacks alternatives to commuting, particularly for those residing in the suburbs of the city. To enhance the reach of car sharing in Rome, it becomes pivotal to integrate it more closely with the existing public transportation system and establish a more substantial and consistent fleet size.

Car logistics, recharging and technical downtime management: managing a carsharing service with an all-electric fleet, like e-GO! Drivalia, requires careful recharge planning to ensure vehicles are recharged and available on time due to the limited availability of charging stations. The interviewee highlighted that: “...Drivalia strives to overcome these challenges, thanks also to the proprietary mobility stores, nevertheless expansion of charging infrastructure is crucial”. Technical downtime poses a significant challenge for Drivalia, resulting in lost potential revenues from unmet demand. To ensure the sustainability of the business, implementing efficient maintenance processes and timely repairs are crucial steps in addressing this challenge.

Vandalism and abuse of vehicles: customers’ harmful behavior pose significant challenges for the business: “...there is a notable difference in customer behavior and attitudes between cities like Rome, Turin, and Milan... unfortunately, Italy still lacks culture of respecting shared resources, leading to incidents of vandalism and disregard for public property”. This general disregard for shared assets adds complexity to managing a carsharing service that must deal with inconsiderate parking and other violations that are not uncommon. Moreover, ensuring that users return vehicles with sufficient charge is crucial to avoid additional logistics and retrieval efforts.

Consumers’ range anxiety in the use of electric vehicles for longer trips: user education plays a crucial role in addressing concerns like range anxiety associated with electric vehicles, as highlighted by the respondent. Unlike competitors offering traditional fuel options, Drivalia faces customers’ fear that electric vehicles may not have sufficient battery charge to reach their destination. This barrier to adoption hinders the dynamics of value capture and emphasizes the need for either effective user education or implementation of new technologies, such as battery swapping, to overcome these concerns.

Price is perceived as a barrier to adoption by consumers: managing customer expectations and price sensitivity is a challenge since, as a business-to-consumer (B2C) service, Drivalia serves a customer base which strongly values affordability, as remarked by the interviewee: “...the carsharing industry's initial pricing strategies, set by early operators, have shaped customer expectations to demand lower and lower fees”. This requires Drivalia to carefully balance pricing while keeping the business alive.

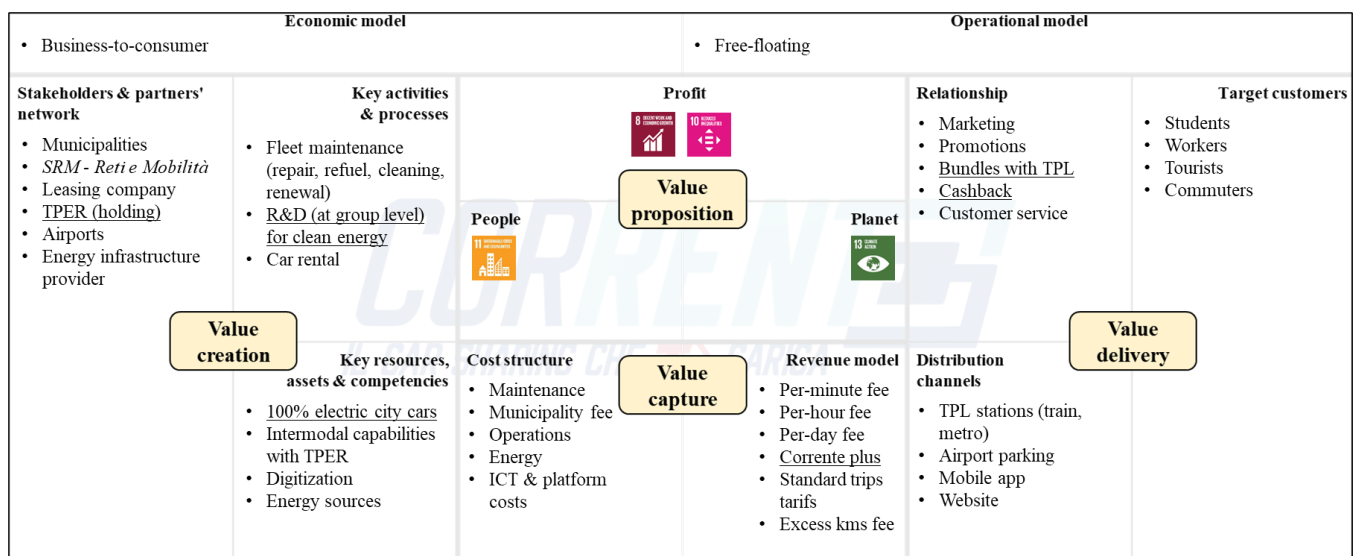
Scarce availability of electric charging stations: Turin stands out with over 400 charging stations, making logistics less complex and more efficient for the company. However, in other cities like Milan, the situation is still evolving with a number of charging stations that: “...sometimes are simply not enough, and the business loses money”. The interviewee argues that competition among providers in terms of pricing war will come, and there will be an increasing need to secure public spaces for installing charging infrastructure.

Crisis in the supply of spare parts due to the closure of Asian borders: The shortage of spare parts in 2022 is still yielding its effects, affecting not only the carsharing industry but the entire automotive sector worldwide (see industry overview).

4.4 Corrente: “Il carsharing che ti carica”

Corrente is the carsharing service of TPER Group, “Trasporto Passeggeri Emilia Romagna S.p.A.”. Headquartered in Bologna, is a publicly owned company primarily engaged in providing mobility services for local public transport and fostering efficient mobility in Emilia-Romagna. The Group's operations span various segments of the transportation industry, including cars, trolleybuses, and freight rail. TPER's strategic focus lies in diversification and intermodality of services, which are vital for improving the overall quality of the transportation system, enhancing urban life, and benefiting the community. In line with this strategic approach, TPER introduced Corrente on October 27, 2018. Corrente is a B2C free-floating carsharing service that complements the local public transport network by providing fully electric vehicles. Initially launched with 120 cars, the service became fully operational in 2019 and expanded to include 335 full electric cars by the end of 2022.

Corrente Business Model Canvas



Source: Personal elaboration

The interview took place with Luca Astolfi, responsible for carsharing operations and contract management, and Paola Matino, mobility manager of the TPER group.

4.4.1 Potential contribution to SDGs

One of the key aspects highlighted by respondents was the potential improvement in accessibility and interconnection of different urban areas. By being active in multiple cities within Emilia-Romagna, Corrente may enhance the touristic development of underserved areas, thanks to a peculiar characteristic of the business model itself: the possibility to freely open and close rides between different cities, thus fostering integration between cities and incremented displacement that translates into enhanced potential economic growth. These concepts align with the following SDG targets:



• **8.1** | Sustain economic growth



• **11.a** | Support positive economic, social and environmental links between urban, peri-urban and rural areas

Corrente's integration with other means of mobility is another notable facet of their approach to sustainable urban mobility. Both respondents emphasized the relevance of the integration between carsharing and public transport, debunking the notion of competition between the two. By positioning Corrente as a complementary option to TPER transports, enforced by the deployment of discounting bundles for commuters with a subscription to TPER, it contributes to reducing reliance on private cars.

Moreover, traffic congestion and limited road space pose significant challenges in urban areas. Corrente addresses these issues by offering wide-ranging rental options to meet diverse customers' demands and encourage reduced car ownership. By promoting the adoption of carsharing as an alternative to private vehicle ownership, Corrente aims to alleviate traffic congestion and enhance road space utilization. These efforts may align with:



• **11.2** | Provide access to... sustainable transport systems for all...

Inclusivity and inequality reduction are also focal points for Corrente, as it allows newly licensed drivers to utilize their carsharing platform. This approach allows people who may not have access to private vehicles to enjoy the convenience of reliable transportation. Additionally, Corrente contributes to increasing the electrification rate of cars by providing consumers with access to electric vehicles, which are typically expensive to purchase. By promoting equal access to an electric means of commuting, Corrente can contribute to:



• **10.3** | Ensure equal opportunity...

Corrente tackles the issue of affordability by offering bundle pricing options. Subscribers of TPER can access Corrente at a considerably reduced rate, encouraging the use of shared cars to enhance the efficiency in the consumption of mobility services. Therefore, Corrente aligns with:



- 8.4 | Improve progressively global resource efficiency in consumption...

Finally, respondents focused on the impact that Corrente has in reducing exhaust emissions. By operating a fleet of fully electric vehicles, Corrente reduces carbon emissions and air pollution deriving from car exhaust emissions, contributing to better air quality in cities. Moreover, TPER's Business Plan prioritizes the optimization of energy consumption, reducing fossil fuel and favoring the use of renewables for recharging cars. This approach contributes to a decrease in CO2 emissions associated with the recharging process. These concepts resonate with:



- 13.1 | Strengthen resilience and adaptive capacity to climate-related hazards...

Respondents concluded by emphasizing that the true potential of carsharing is fully realized when alternative means of transportation to private mobility are operating efficiently, underlining the importance of a comprehensive and integrated mobility ecosystem.

4.4.2 Enabling value creation and delivery elements and external factors

Stakeholders & partners' network: Agreements with companies for reserved parking slots is a relevant factor. By partnering with various organizations, such as Bologna Airport and Philip Morris, Corrente seeks to address mobility gaps and offer integrated solutions for employee transportation. These agreements often involve financial contributions from companies to provide discounted TPER subscriptions and Corrente minutes of usage to their employees to target their specific needs.

Moreover, Corrente places great emphasis on its relationship with local administrations to obtain licenses for parking, including dedicated parking spaces, and access to restricted traffic zones (LTZs). By paying fees to municipalities, Corrente ensures that its vehicles can enter the designated LTZs and park for free: *"...these benefits are key to instill a change in consumers' behavior and adopt carsharing services instead of private cars"*.

Key resources, assets, and competencies: Respondents stressed the importance of leveraging the capabilities of their parent company, TPER, that drives efforts in R&D for clean energy. TPER is committed to use renewable energy sources for recharging Corrente cars, ensuring zero emissions not only within the territories served by Corrente but also throughout the entire supply chain. By tapping into TPER's expertise and resources, Corrente can improve its overall environmental sustainability contribution for a more sustainable urban mobility.

Additionally, their mobile app is a key resource as it integrates the reservation system and allows customers to view nearby cars on a map and start their rides seamlessly. On this, Corrente envisions integration with TPER's ROGER app to facilitate multimodal mobility, enabling users both to reserve cars and have access to information related to public transport.

Another key feature is the ownership of strategically located proprietary mobility hubs for recharging vehicles. When entering a new city, the company builds dedicated charging hubs and employs an algorithm-driven logistics app to efficiently manage retrieval and recharging of low-battery cars in mobility hubs. Therefore, Corrente tried to address customers' range anxiety, instilling confidence among their users.

Customer Relationships: one important aspect is the offering of bundles and promotions linked to the use of LPT. Corrente recognizes the value of integrating resources and collaborating with TPER to offer more affordable fees, thereby enhancing the accessibility and economic convenience of their carsharing service. Tailored offerings enable matching with diverse consumers' needs. For example, for customers who require longer access to vehicles, "*Corrente Plus*" was introduced, allowing extended access to vehicles for a week up to a month. Lastly, to enhance customer loyalty and incentivize usage, Corrente has implemented a cashback model, as a portion of the amount spent is returned as driving credit the following month. This loyalty program aims to establish customer lock-in and create a virtuous cycle promoting the use of shared assets for sustainable urban mobility.

Distribution Channels: Strategic contact points, such as airports and train stations, serve as important hubs for Corrente's operations, as they allow Corrente to facilitate convenient access to their carsharing service. Moreover, Corrente's operational area encompasses multiple cities, enabling customers to circulate and close rides across different locations. This distinctive feature sets Corrente apart from other carsharing services. As Ms. Matino emphasizes: "*With Corrente, users have the flexibility to open a ride in one city and close it in another one within the same operational area*".

This flexibility allows customers to seamlessly travel between cities like Bologna, Ferrara, and Rimini, making Corrente a convenient choice for multi-city commuting.

Positive external factors: First, the municipality of Bologna implemented incentivizing policies for carsharing, aiming to reduce the number of private cars in the historic center and promote sustainable mobility options:

1. In the initial call for proposals, zero fees have been requested from electric carsharing operators within Bologna's territory.
2. "Mobility credits" to purchase public transport tickets, carsharing, bike sharing and taxi services have been given to residents who gave up their personal license to park private cars in the historic center.
3. "PrIMUS" project, that consisted in the issuance of mobility vouchers of €200 to the first 900 eligible users for using Corrente, thus pushing demand towards their carsharing service.

Second, respondents argued that consumer behavior has undergone significant changes after the health emergency due to Covid-19, as leisure activities have returned to pre-pandemic levels, causing a demand

shift towards longer rentals, creating a new segment to be targeted with longer-term offerings, such as “*Corrente Plus*” or per-day fees for vacations.

4.4.3 Challenges in value capture dynamics

Automotive crisis: Corrente was impacted by the recent crisis in car deliveries, which extended lead times and uncertainties specifically for electric vehicles (see industry overview). Mr. Astolfi said that: *“Unfortunately, to date, we are in a position to be able to reserve vehicles but with lead times of 12 to 18 months ... [and] that in the rapidly evolving EV market, a mere six-month timeframe can witness significant changes, causing plenty of uncertainty”*.

Currently, Corrente partners with Renault Italy for the supply of EVs for their fleet, nonetheless there will be a decrease in the number of active vehicles over the next few months. Corrente had a fleet of 385 cars in 2022, which was reduced to 335 at the beginning of 2023, and will further decrease to below 300 cars in the summer period. Moreover, the automotive crisis affected the availability of spare parts for maintenance, creating challenges in releasing idle vehicles from maintenance workshops.

Energy crisis: respondents from Corrente were the first in the sample to mention the challenges deriving from the Ukrainian war, which caused a significant increase in energy prices, thus raising the cost of supplying electricity to recharge cars. The overall profitability of their business has been severely affected (see next chapter).

Development of micromobility: the emergence of scooters and bikes as a popular form of shared micromobility gained momentum, pushed by a shift in consumer preference to adopt these solutions for shorter distances, thus eroding a portion of the traditional last-mile transportation segment. Mr. Astolfi stressed that: *“...maybe the expanding micromobility is partially eroding the demand for all those short-distance rentals that could have been fulfilled through carsharing”*. Therefore, the rise of micromobility may have “cannibalized” the carsharing demand for shorter trips.

4.5 E-Vai: “*Il carsharing fuori dal comune*”

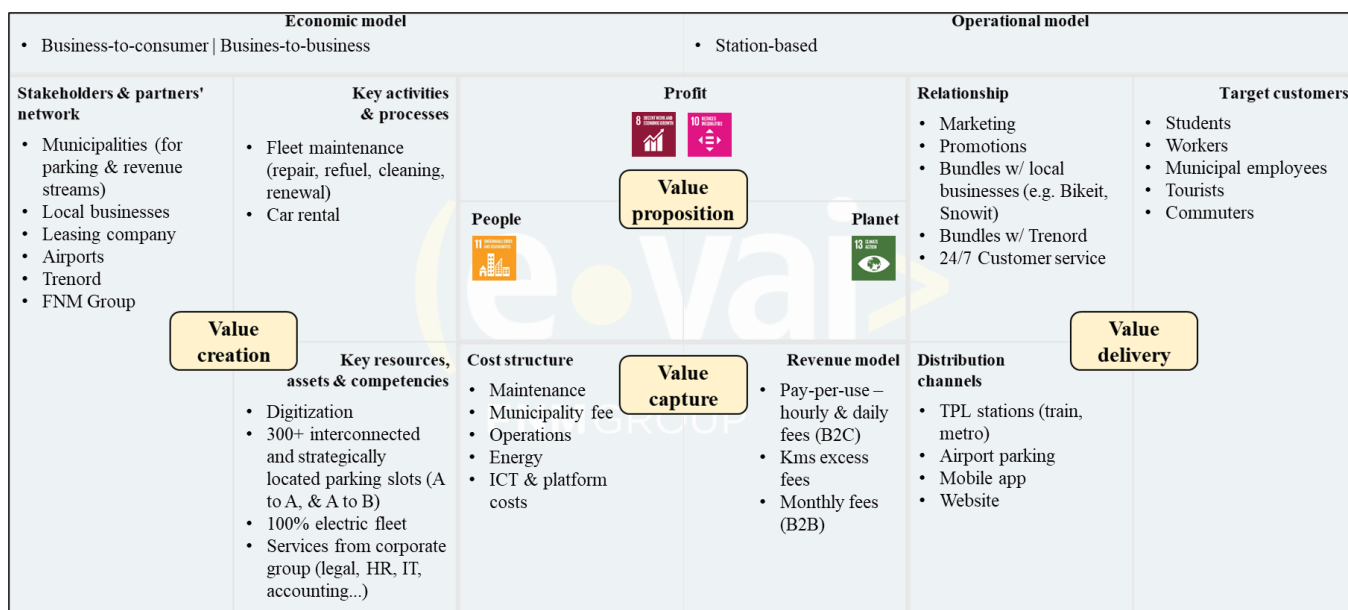
E-Vai is an electric station-based carsharing service that is seamlessly integrated with Lombardy's rail system, being a wholly owned subsidiary of FNM Group, “*Gruppo Ferrovie Nord Milano S.p.A*”. The group combined expertise in rail infrastructure management, road mobility and highway infrastructure management to introduce E-Vai as an innovative model for “walking the last mile”. E-Vai strategically targets areas with lower population density while ensuring better geographical coverage compared to free-floating services.

E-Vai operates a 100% fully electric fleet and boasts a network of over 300 car pick-up/drop-off locations spanning across more than 110 municipalities in Lombardy. The company also addresses the B2B segment

by offering municipalities an opportunity to transition to energy-efficient transportation by replacing outdated fleets with state-of-the-art electric cars.

The station-based approach adopted by E-Vai allows for adaptability to cities of varying sizes. For instance, in Milan alone, it provides 112 dedicated parking stalls, while also extending its services to medium-sized, small municipalities, and even remote communities. The collaboration with Trenord, a joint venture between FNM and Trenitalia, further enhances the offering by facilitating intermodal, urban, and extra-urban mobility through bundled services. E-Vai's distinctive carsharing model enables convenient travel between different municipalities, as well as seamless roundtrips to airports and train stations, eliminating the hassle of parking.

E-Vai Business Model Canvas



Source: Personal elaboration

The interview took place with Matteo Brambilla, Head of Marketing, and Francesco Pedol, Head of New Business Development.

4.5.1 Potential contribution to SDGs

First, E-Vai's regional carsharing service improves accessibility and interconnection between urban areas by connecting small municipalities to big mobility hubs like airports and main railway stations, thus ensuring continuous transportation services and enabling seamless transitions between different phases of travel. The service particularly benefits communities with limited transportation options, providing them with sustainable and connected mobility solutions: *“We are the carsharing out of the municipality because we have this idea of proximity in the neighboring and suburban municipalities”*. Users can book cars through the app and find them in designated parking lots, enabling convenient travel to desired destinations. E-Vai aims to bridge the transportation gap in localities outside major urban centers, which may have limited access to public transportation services. While rail lines may not cover all areas, and buses in small-

population municipalities have inflexible schedules, carsharing provides a flexible and accessible mobility solution. For this reasons, E-Vai aligns with the target:



- **11.a** | Support positive economic, social and environmental links between urban, peri-urban and rural areas

By extending its reach to small municipalities and connecting them to airports and major railway stations, E-Vai also enhances the touristic appeal and connectivity of these areas poorly connected by LPT. For instance: “*someone arriving at Malpensa Airport can easily reach destinations like Domaso, a small village on Lake Como, within a two-hour car ride, bypassing the time-consuming transfers required by other modes of transportation such as LPT*”. This approach improves social inclusion and indirectly boosts tourism, contributing to the overall development of these locations, thus aligning with:



- **8.1** | Sustain economic growth

Strictly related to this, E-Vai's station-based model, unlike free-floating models, ensures access to cars in a much wider area, promoting social inclusion. By offering bookable carsharing cars in municipalities, individuals gain the opportunity to easily connect to various destinations, reducing disparities based on residency, place of birth, or domicile. Moreover, similar to Drivalia and Corrente, E-Vai encourages the adoption of electric vehicles among customers who may not be able to afford purchasing one. Therefore, E-Vai potentially contributes to the goal of social inclusion, aiming towards the target:



- **10.3** | Ensure equal opportunity...

E-Vai, like other carsharing operators, offers the opportunity to reduce individual car ownership and alleviate traffic congestion, addressing the inefficiency in the use of private vehicles (often utilized less than 10% of the time). Additionally, integrating carpooling services, such as BlaBlaCar, with carsharing would further contribute to vehicle reduction and enhance efficiency. While carpooling is predominantly developed in the business-to-business (B2B) sector, “*...the potential integration of carpooling and carsharing in the business-to-consumer (B2C) market holds promise for achieving Pareto efficiency and maximizing the benefits of shared mobility*”. In this way, E-Vai potentially contributes to the development of a sustainable mobility in urban contexts, aligning with:



- **11.2** | Provide access to... sustainable transport systems for all...

E-Vai adopts a pay-per-use in B2C, bearing the costs of car tax, insurance, routine and extraordinary maintenance and fuel costs. With E-Vai: “*...occasional users may spend around €300 to €400 per year, while heavy users can still enjoy cost savings compared to owning a car*”. Moreover, such model eliminates the need for fixed monthly fees, allowing users to pay only for the actual time they use the vehicle. This

flexibility ensures economic efficiency, particularly for individuals who use cars infrequently. Moreover, it promotes shared car usage and enhances the efficient utilization of vehicles, resulting in a potential contribution of E-Vai to the SDG target:



- **8.4** | Improve progressively global resource efficiency in consumption...

Finally, E-Vai is committed to reduce exhaust emissions for an improved urban air quality. Their fleet consists of modern and electric vehicles, contrasting with the older private cars prevalent in Italy. As a 100% electric fleet: “...each kilometer traveled by E-Vai's vehicles saves approximately 125 grams of CO2 emissions”. With an average of 35 kilometers per rental and 25 to 30 rentals per day in Milan, E-Vai achieves a substantial daily reduction of around 120,000 grams of CO2 emissions. E-Vai's commitment to electric carsharing significantly contributes to cleaner air, aligning with:



- **13.1** | Strengthen resilience and adaptive capacity to climate-related hazards...

4.5.2 Enabling value creation and delivery elements and external factors

Stakeholders & partners network: the company makes agreements with municipalities to provide a dedicated mobility solution and a carsharing platform serving municipal employees during working hours and is shared with citizens when not used. Similar agreements are made with companies, offering dedicated parking and car rental options for employees, both for business and private use. These partnerships generate new revenue streams and support E-Vai's value creation dynamics.

Key activities and processes: Renting cars from third-party providers offers E-Vai operational flexibility, eliminating the need to handle insurance separately. In the event of any damage, the company simply pays a deductible to the rental service for repairs, streamlining the financial aspects of maintenance and ensuring efficient operations. This flexibility also enables E-Vai to consistently update its fleet, offering users the latest and most eco-friendly vehicles.

Key resources, assets & competencies: E-Vai offers the advantage of more than 300 dedicated parking lots, most of which integrated with recharging stations for its electric fleet, ensuring easy access for customers in different areas. E-Vai also plans to introduce hybrid vehicles in its fleet: “...especially for longer distances and municipalities with limited charging infrastructure ...electricity is not a dogma for us, but rather an opportunity, as it may not always be the most suitable solution”. Lastly, the company benefits from synergies with the holding, such as HR, legal, purchasing, accounting, and IT, provided by the group. This collaborative approach allows for efficient integration and shared resources among FNM Group companies, fostering a comprehensive and customer-centric mobility experience.

Customer Relationships: E-Vai has established strategic partnerships with companies like Bikeit and Snowit to offer bundle packages that combine E-Vai carsharing bookings with accommodation,

summer and winter sports equipment, and ski passes. This collaboration delivers unique value to customers that are more prone to adopt E-Vai's carsharing service. Moreover, as part of the FNM Group, E-Vai collaborates with Trenord to offer a seamless customer experience by creating promotions which users subscribed to the LPT can benefit, such as a 10% discount and entry credits for using carsharing, thus complementing their regular train services and connecting various municipalities in Lombardy.

Finally, E-Vai strategically places its parking lots across Lombardy, even in small municipalities, ensuring a continuous and interconnected transportation experience for end users throughout their journey.

4.5.3 Challenges in value capture dynamics

Car logistics management: operating a widespread carsharing service like E-Vai comes with significant fleet management costs, especially when transporting cars across extensive territories to meet rental demands. The nature of carsharing, with cars being picked up and dropped off at different locations, creates logistical and range limitations for electric vehicles. Unlike city-based free-floating rentals with more predictable flows, E-Vai's coverage area is extensive, and rental patterns can be unpredictable. This presents challenges in terms of fleet logistics, leading to higher operating costs, particularly when it involves long-distance vehicle transfers for relatively small revenue gains. This impact becomes more significant when considering the expansion of the service to regions beyond Lombardy, as E-Vai intends to do.

Rising energy prices: the ongoing energy crisis caused by the Ukrainian war has led to a significant rise in energy prices, directly impacting 100% electric carsharing companies like E-Vai, which experienced “...a substantial 40% increase in operating costs for recharging vehicles as a result of these price hikes” (see next chapter).

Political will and slow and bureaucratic procedures of municipalities: the political will to implement carsharing services needs to be translated into administrative actions, such as municipal resolutions or public expressions of interest. Both respondents highlighted that this bureaucratic process often leads to slow decision-making and lengthy negotiations with municipalities: “...it can take 9 to 24 months to establish carsharing programs due to these lengthy procedures”. Consequently, there is a missed opportunity to capture potential revenue from carsharing demand that could exist but remains unsatisfied due to delays in obtaining operating concessions from municipalities.

4.6 Osservatorio Nazionale Sharing Mobility

“*Osservatorio Nazionale Sharing Mobility*”, established in September 2015, is an Italian collaborative initiative led by “*Ministero della Transizione Ecologica*”, “*Ministero delle Infrastrutture e della Mobilità Sostenibili*”, and “*Fondazione per lo Sviluppo Sostenibile*”, as well as a key stakeholder for sharing mobility. Its primary objective is to foster cooperation among public and private entities, sharing operators, and the research community in order to analyze, support, and promote the sharing mobility phenomenon

within the Italian territory. Massimo Ciuffini, the interviewee, has been actively involved in research activities since 2009 and currently holds responsibilities in the areas of "Sustainable Mobility" and as the technical coordinator of OSM since 2016.

4.6.1 Potential contribution of carsharing to SDGs and grounding pre-conditions

Mr. Ciuffini promptly highlighted that the relationship between carsharing utilization and car ownership reduction is not straightforward and necessitates careful examination. He stresses that even if a measured correlation can be observed in research, it does not imply causation. Studies conducted by OSM show that usually carsharing users exhibit virtuous behaviors, including walking, utilizing public transportation, and cycling. Such behaviors are interconnected and there is a recursive interaction among them. The interviewee stated that: "...the essential precondition for carsharing to have a meaningful impact is entirely behavioral and must exist beforehand". By integrating with existing public transportation systems, carsharing services can complement them in covering unsatisfied demand, thus enhancing the effectiveness and efficiency of the overall "sustainable mobility ecosystem". If carsharing operators can effectively leverage robust value creation and delivery elements, resulting in a satisfactory economic return and capturing a portion of that value, it would facilitate investments such as fleet expansion and service quality enhancement, ultimately leading to greater service availability. This, in turn, has the potential to encourage consumer adoption of this form of shared mobility, driving their behavior and contributing to setting the "preconditions" for sustainable mobility to effectively replace the use of private cars. In this sense, traffic congestion reduction could be another significant indirect contribution of carsharing, as a consequence of a reduction in motorization rates. These potential effects align with:



• **11.2** | Provide access to... sustainable transport systems for all...



• **11.a** | Support positive economic, social and environmental links between urban, peri-urban and rural areas

Furthermore, many carsharing operators embrace electric or newer and less polluting cars in their fleets, usually through rental contracts that guarantee the last available technology in the market. This reduces exhaust emissions and lowers fuel consumption due to higher energetic efficiency levels. In Italy, carsharing has achieved an electrification rate in 2021 of approximately 27%, which is significantly higher than the electrification rate of private vehicles, which stands at a mere 0.2%. Although the absolute numbers of electric vehicles in carsharing fleets may still be relatively small, the percentage of electric vehicles within the carsharing sector is notably higher than in private car fleet, highlighting its success in adopting and promoting electric mobility. These considerations align with:



• **13.1** | Strengthen resilience and adaptive capacity to climate-related hazards...

Mr. Ciuffini believes that carsharing can also contribute to socio-economic sustainability, particularly in outlying areas, by providing transportation options for individuals visiting cities temporarily and thus increasing the touristic appeal of the area. The facilitation of tourism through carsharing can have a positive impact on local economies, generating increased revenue, job opportunities, and overall economic growth within the region. Subsequently, the interviewee emphasized the potential cost reduction in using carsharing especially for shorter distances. It is reasonable to match these reasonings with:



• **8.1** | Sustain economic growth

Lastly, Mr. Ciuffini highlighted the necessary conditions and support required to reach these goals. As municipalities play a critical role in promoting carsharing adoption, they should:

1. Establish policies that make private car usage less convenient, thereby increasing the competitive advantage of carsharing.
2. Foster the growth and integration of alternative mobility options alongside carsharing, improving for example the efficiency and effectiveness of LPT and micromobility.
3. Provide incentives to carsharing operators by avoiding excessive fees and taxes, treating carsharing on par with other private mobility alternatives (i.e. LPT).
4. Enable the electrification of fleets by developing a firm and far-reaching charging infrastructure.

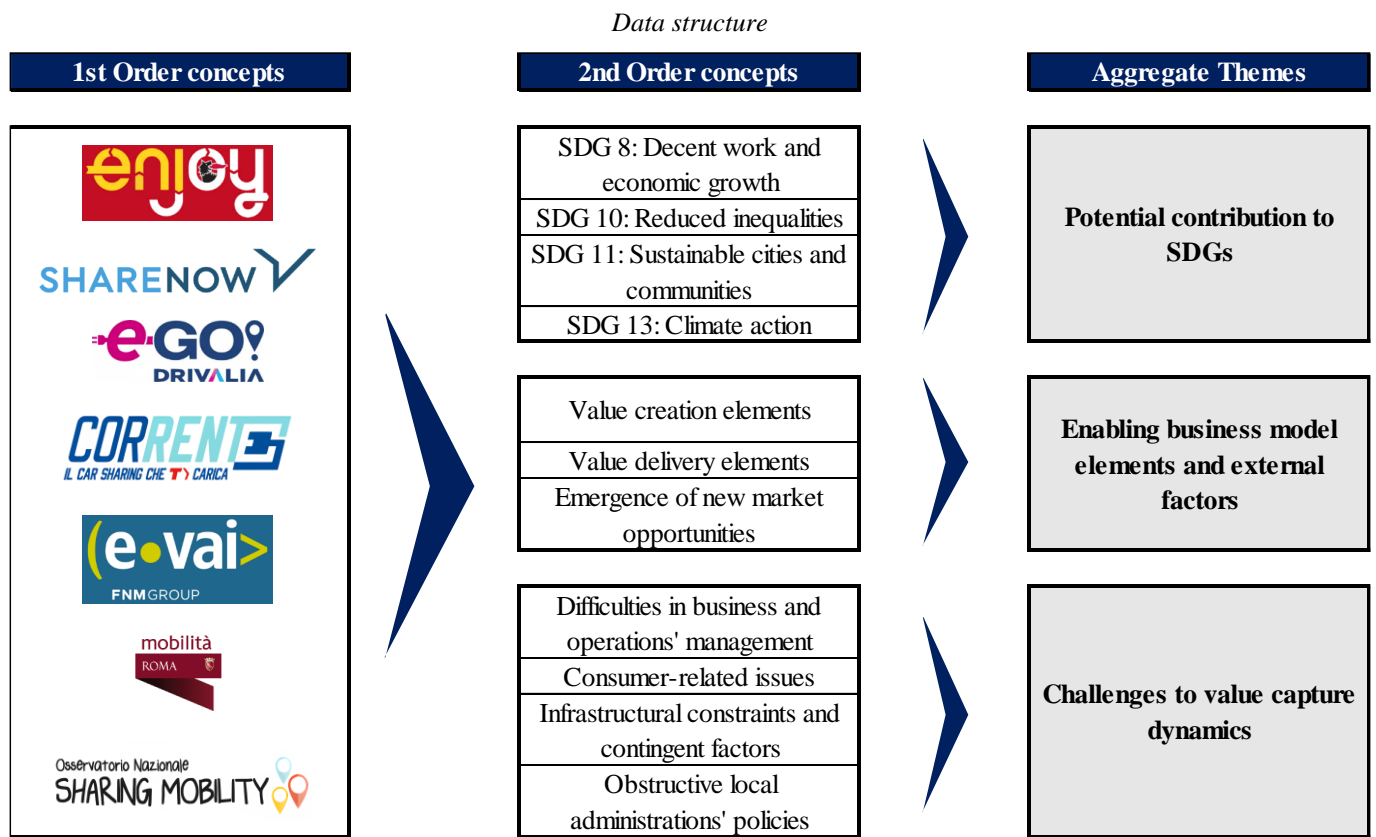
In conclusion, Mr. Ciuffini foresees future potential for carsharing in Italy whether the necessary conditions will be established for it to reach its full potential.

5. KEY FINDINGS AND ANSWERS TO RESEARCH QUESTIONS

This chapter presents key findings aimed at bridging the research gaps identified in the literature review and answering the three main sub questions related to:

1. The potential contribution of Italian carsharing operators to the SDGs in promoting a more sustainable urban mobility.
2. The key business model elements and external factors that support Italian carsharing operators in creating and delivering value.
3. The challenges that currently hinder Italian carsharing operators' value capture dynamics.

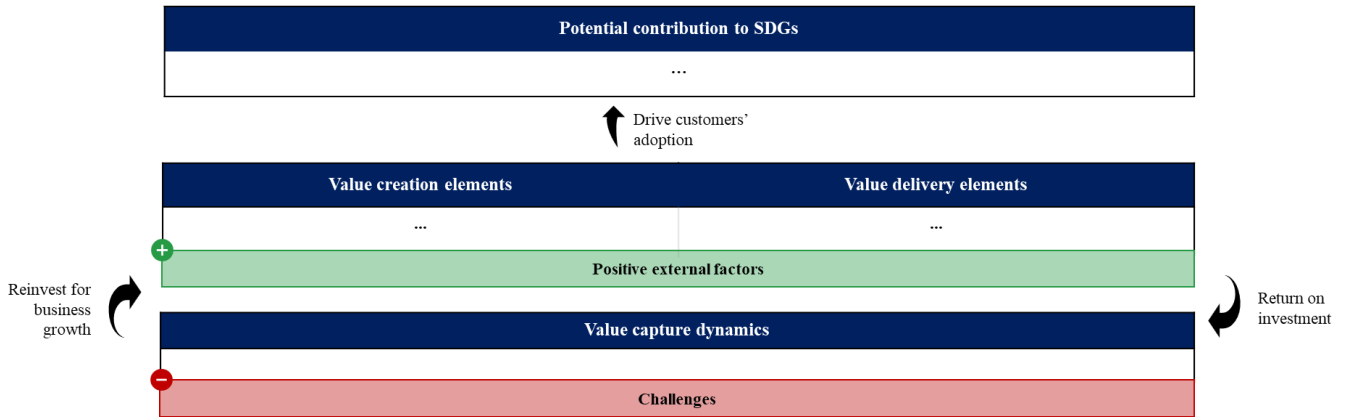
To analyze the interview data and identify patterns across individual cases, the author employed thematic analysis using a six-phase framework detailed in the methodology chapter. In the final phase of the coding process, a coding table (see appendix) and a data structure were created to provide readers with an immediate visual representation of the analysis:



Source: Personal elaboration

To organize key findings and build interconnections across the three research areas, the author has developed a framework connecting business model's value dynamics to potential contributions towards the SDGs, which will be progressively filled as the analysis progresses:

Findings framework: value dynamics and potential contribution to SDGs



Source: Personal elaboration

In a nutshell, the framework's logic can be summarized as follows: the presence of value creation and delivery elements, combined with positive external factors, plays a pivotal role in facilitating consumers' adoption of carsharing. This, in turn, enables operators to pursue specific targets aligned with the SDGs while generating economic returns that can be reinvested to foster business growth. However, this process is non-linear, as the research has revealed various challenges that impede operators from fully capitalizing on the generated value. Consequently, this leads to low profitability and limited opportunities for reinvestment. In line with the interview protocol, the analysis will discuss potential contribution of carsharing to the identified SDGs, then examine the enabling business model elements and external factors, and eventually explore the challenges that hinder value capture dynamics. Each section will provide detailed information and analysis to address the corresponding sub-research questions.

5.1 Potential contribution of Italian carsharing operators to SDGs

The elements emerged from interviews and in-depth analysis of each case were connected to specific goals and targets of the 2030 Agenda, reflecting potential contributions to the sustainable development of urban mobility. Four SDGs were identified, encompassing six specific targets. For this analysis, only data and insights obtained directly from carsharing operators were considered, validated by the opinions obtained from OSM. To provide a clear overview, a short summary of key findings is presented below:

Evidence from interviews: carsharing potential contribution to SDG targets

Carsharing	SDGs targets					
	8.1	8.4	10.3	11.2	11.a	13.1
	Sustain economic growth	Improve progressively global resource efficiency in consumption	Ensure equal opportunity	Provide access to sustainable transport system for all	Support positive economic, social and environmental links between urban, peri-urban and rural areas	Strengthen resilience and adaptive capacity to climate-related hazards
		✓		✓		✓
		✓		✓		✓
		✓	✓	✓		✓
	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓

Source: Personal elaboration

Three targets that consistently emerged across all five case studies are 8.4, 11.2, and 13.1. The remaining three targets, however, are more specific to individual case studies, such as being part of a transportation group (Corrente: TPER, E-Vai FNM Group) for targets 8.1 and 11.a, and deploying electric fleets (e-Go Drivalia, Corrente, E-Vai) for target 10.3.

5.1.1 Context-independent SDG targets

The main SDG target, identified unanimously by respondents as key, is 11.2, which strives to ensure access to a sustainable transport system for all.



• 11.2 | Provide access to... sustainable transport systems for all...

The pivotal concept around it is the correlation between the introduction of carsharing services in urban areas and the subsequent decline in motorization rates: car ownership reduction.

This finding confirms the anticipated value created by the theory of SPSS models in terms of sustainability. By maximizing the use of assets and minimizing resource usage, SPSS models align with principles of efficiency and contribute to sustainable practices. In this context, these dynamics would lead to reduction in private car ownership.

The interviewees collectively referenced several academic studies related to car ownership reduction effect to support their claims, including some of those previously examined in the literature review (see appendix). However, the correlation between carsharing and reduced motorization rates is indirect, and a direct causal relationship is yet to be established. During the interviews, Mr. Ciuffini (OSM) explored the underlying factors influencing the relationship between carsharing and reduced motorization rates. He suggested that in specific contexts, the introduction of carsharing has triggered a change in purchasing behavior and travel habits among users, leading them to rely less on private cars and instead embrace sustainable mobility options. In this context, carsharing serves as a viable alternative to private car ownership and has the potential to contribute to the decline in motorization rates: *"...the essential precondition for carsharing to have a meaningful impact is entirely behavioral and must exist beforehand"*. And such behavior must be induced by operators that create and deliver value for them, thereby promoting adoption.

Assuming the reliability of studies in the literature and considering that the nature of the carsharing business model relies on principles of SPSS (see literature review), the potential reduction effect of cars in circulation depends on the presence of the following key factors:

- Ubiquitous presence of carsharing fleets and immediate car availability in the area.
- Efficiency of alternative sustainable mobility solutions (i.e. LPT, taxis, micromobility...), relieving concerns and enabling a shift in consumers' mindset towards sharing instead of relying on private mobility.

- Integration with alternative mobility solutions, creating a sustainable mobility “ecosystem”.
- Economic convenience in using carsharing for those users who make moderate use of the car.

If these conditions and key assumptions are valid, carsharing operators can potentially contribute to the sustainable development of urban mobility by reducing private car ownership.

First, the market is not yet mature enough to be say that carsharing operators are direct “competitors”, as Mr. Rovatti (Enjoy) suggested: “...it is more apt to view other carsharing providers as partners in the collective endeavor to expand the availability of vehicles and positively impact the sustainability of urban mobility in cities”. This is key to reach the first pre-condition.

The second precondition emphasizes the need for public policies enhancing the effectiveness and efficiency of public transportation, thereby establishing a strong alternative. However, this aspect is lacking in many Italian cities, as repeatedly highlighted by the interviewees.

The third precondition finds real match only in those cases where carsharing was initiated within corporate groups involved in transportation. These services integrate seamlessly with local public transportation (LPT), offering users a complete and interconnected mobility experience.

Regarding the last condition, a cost-effectiveness analysis was conducted in 2019 by *Università degli studi di Genova*, ICS (“*Iniziativa Car Sharing*”) and C.I.E.L.I. (“*Centro Italiano Di Eccellenza Sulla Logistica e Infrastrutture*”), in collaboration with the Italian Ministry of the (“*Ministero dell'Ambiente e della Sicurezza Energetica*”), to compare the financial viability of carsharing versus private car ownership¹⁰². The study calculated the total cost of using a private car based on mileage and car age, with initial depreciation being a significant factor.

In brief, the analysis focused on two classes of cars (city and compact cars) commonly used for carsharing. Assumptions were made regarding the type of carsharing service (free-floating or station-based), number and duration of trips, and corresponding applied rates. The study aimed to evaluate whether carsharing could be a convenient alternative to private car ownership and its potential impact on reducing car ownership rates. Economic convenience was assessed based on annual travelled kilometers within which carsharing, both free-floating and station-based, are convenient considering 2019 usage profiles and popular car classes in Italy.

¹⁰² ICS, Università degli studi di Genova, & C.I.E.L.I. (2019). Ricerca sulla convenienza economica del car sharing. ICS. Available online: [Link](#)

Carsharing convenience threshold per car age and class (2019)

Car ages	Car classes	Carsharing convenience threshold (<)	
		FF	SB
New car	City car	7,050	7,800
	Compact	9,500	10,500
3y old car	City car	4,100	4,400
	Compact	4,400	4,800
9y old car	City car	3,400	3,700
	Compact	3,550	3,800

Source: Personal elaboration from ICS et al. (2019)

The main findings of the study are:

1. The convenience threshold varies based on car type, increasing with higher car classes. For a new car, the affordability threshold for city cars is 25% lower than that for compact cars. The difference diminishes as the car ages.
2. Station-based schemes have a slight advantage over free-floating schemes, with approximately 10% cost savings for new cars, decreasing to 7% for 9-year-old cars.
3. In absolute terms, the cost-effective mileage for a new city car ranges from 7,000 to 8,000 km per year, which is significant but not excessively high. The threshold decreases over time, halving the cost-effective mileage for a 9-year-old car.
4. For compact cars, the affordability threshold for a new car can exceed 10,000 km per year, approaching the average Italian mileage. However, as the car ages, the threshold decreases to approximately 3,500-3,800 km, similar to the thresholds for city cars.

Considering data from 2021, i.e. the average mileage of Italian cars (10.712 km per year) and of the age of the car fleet (11.5 years old), carsharing services are still shown to be economically not very competitive on a large scale if compared to these findings¹⁰³. It is crucial to acknowledge that the study was conducted in 2019, and since then, market dynamics and underlying assumptions may have evolved. Therefore, more recent and updated studies are needed to capture any changes and ensure the relevance and accuracy of the analysis.

Nevertheless, based on the findings of this study, it becomes apparent that carsharing operators have yet to significantly reduce mobility costs for users. The last precondition has not occurred yet.

Consequently, carsharing operators have the potential to align with target 11.2 of the 2030 Agenda, which strives to ensure access to a sustainable transport system for all. However, for this potential to be realized, the aforementioned preconditions need to be met, which is currently not the case.

The fourth precondition outlined above highlights the importance of aspiring to the target SDG 8.4, which centers on enhancing global resource efficiency in consumption.

¹⁰³ UNRAE (2022)



• **8.4** | Improve progressively global resource efficiency in consumption...

Carsharing operators address this target by trying to foster adoption to their service through differentiated rental options to meet various customer needs. Free-floating models, for example, provide flexible pricing with minute fees for short trips and daily or long-term fares for extended journeys, trying to enhance accessibility of the service. Share Now takes it a step further by introducing a subscription model, offering discounted rates for users with a monthly pass. Additionally, Corrente and E-Vai models emphasize collaboration with corporate groups, offering bundled packages that integrate with public transportation services, further promoting the integration of alternative mobility options over private car usage. However, studies in literature, like the one conducted by ICS, cannot fully confirm the claims made by respondents. If economic inconvenience remains a significant barrier for most potential users, the core value proposition of carsharing, which is maximizing asset utilization and consumption efficiency, may not be fully realized. Therefore, while carsharing operators have the potential to align with the SDG target 8.4, their actual contribution in this regard remains prospective.

An argument that consistently arose from the interviews is the emphasis on reducing exhaust emissions to improve air quality in cities, which aligns closely with the goal of reducing private car ownership. Interviewees frequently highlighted the benefits of replacing older, less environmentally friendly vehicles with newer models with lower emissions. This argument holds even greater weight when carsharing operators incorporate electric cars into their fleets, as these vehicles produce zero exhaust emissions. However, further quantitative studies are necessary to investigate the impact of carsharing on emissions reduction in Italian cities, offering a potential avenue for future research.

This argument, though still in the realm of potential contribution, can be reasonably correlated with the SDG target 13.1, which focuses on fortifying resilience and adaptability to climate-related risks and environmental catastrophes.



• **13.1** | Strengthen resilience and adaptive capacity to climate-related hazards...

5.1.2 Context-specific SDG targets

The next three targets are closely related to specific operating models and business characteristics.

From the interviews with Corrente and E-Vai, it became evident that carsharing can enhance tourism in areas with limited access to LPT. Both services, being part of corporate transportation groups, strive to provide users with a seamless mobility experience. A respondent from E-Vai mentioned that: “...*someone arriving at Malpensa Airport can conveniently reach destinations like Domaso, a small village on Lake Como, within a two-hour car ride, bypassing the time-consuming transfers required by other modes of transportation*”. This concept is further supported in the case of E-Vai due to its station-based business

model, which ensures easy accessibility for public transport users as parking lots are strategically located outside the stations. The reasoning for Corrente is slightly different, as their vehicles can circulate without limits (also locking and unlocking cars) in a large operating area encompassing multiple cities in Emilia Romagna, contributing to increasing the inflow of tourists to smaller cities. By facilitating tourism to smaller, less connected locations with public transport, carsharing aligns with target the SDG 8.1, which aims to support economic development.



• **8.1** | Sustain economic growth

Carsharing operators from the considered sample that currently offer electric vehicles in their fleets raised an argument of increased electric vehicle adoption. This is particularly significant considering that the electrification rate of private vehicles in Italy is only 0.2%, as highlighted in the industry overview section. By providing users with access to electric vehicles, these operators help reduce inequalities by offering individuals the opportunity to experience electric vehicles, which might otherwise be financially inaccessible or limited in availability. This aligns with SDG target 10.3, which aims to ensure equal opportunity.



• **10.3** | Ensure equal opportunity...

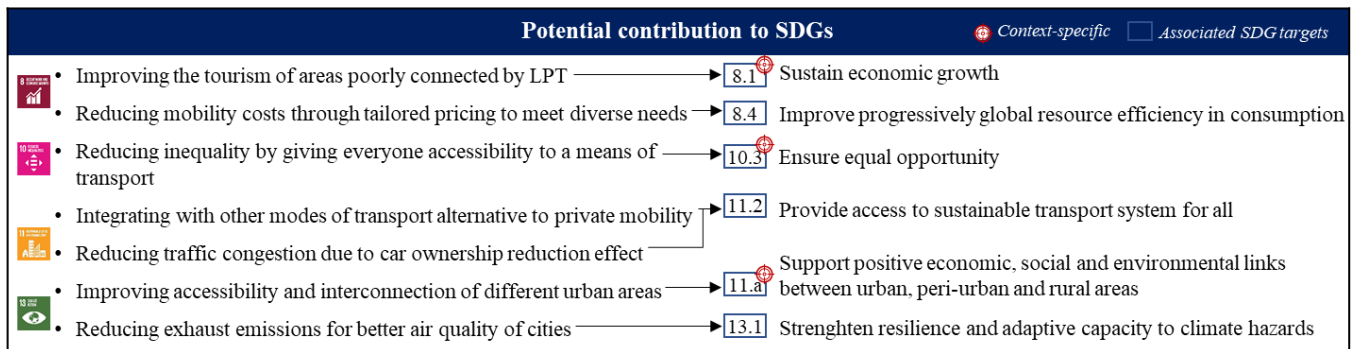
Finally, carsharing operators from the sample that operate across extensive geographical areas, i.e. Corrente and E-Vai, have articulated a compelling argument concerning the improvement of interconnectivity and integration among diverse urban areas, where LPT doesn't arrive. E-Vai ensures easy accessibility for commuters with its extensive area and 300+ parking lots strategically located in Lombardy. Corrente's vehicles can circulate without limits (also locking and unlocking cars) in a large operating area encompassing multiple cities in Emilia Romagna. As a result, they contribute to the realization of SDG target 11.a, which aims to facilitate positive economic, social, and environmental ties between urban, peri-urban, and rural areas.



• **11.a** | Support positive economic, social and environmental links between urban, peri-urban and rural areas

Upon completion of the analysis, it is now possible to compile the first component of the framework:

Potential contribution to SDGs



Source: Personal elaboration

The first sub question of the research at hand can now be answered based on the evidence gathered from interviews and the thematic analysis conducted by the author:

SQ1: *What Sustainable Development Goals do Italian carsharing operators potentially contribute to?*

The author's research indicates that carsharing has the potential to make significant contributions to four SDGs: Goals 8, 10, 11, and 13. These SDGs encompass six specific targets: 8.1, 8.4, 10.3, 11.2, 11.a, and 13.1. However, the extent of these contributions may vary depending on the specific operating models and characteristics of the carsharing business. The research identified three targets – 8.4, 11.2, 13.1 – to which all operators, independently from their business model configuration or context-specific characteristics, potentially contribute. The achievement of such goals is closely tied to the characteristics of the SPSS business model on which carsharing is grounded, its car ownership reduction effect through maximization of output (transportation) and minimization of inputs (cars). It is important to note that the realization of a reduction in private car ownership is contingent upon the fulfillment of four basic preconditions that are currently lacking. Therefore, it is crucial to further explore and validate the potential contribution of carsharing to these SDGs through additional research and analysis, in order to determine whether this potential can be transformed into tangible outcomes.

Three specific SDG targets - 8.1, 10.3, 11.a - were subsequently uncovered, each requiring the involvement of operators possessing context-specific characteristics, such as being affiliated with corporate transportation groups, operating within extensive operating areas and deploying electric fleets.

5.2 Enabling business model elements and external factors

This section aims to analyze the key components of carsharing business models, regardless of their operational configuration (free-floating or station-based), and the external factors enabling operators to create and deliver value towards customers, driving adoption towards carsharing for a more sustainable urban mobility.

In the following sections, each business model element and external factor identified in the comprehensive framework will be explained in more detail and discussed.

5.2.1 Value creation elements

In the **stakeholders and partners' network** block, the first crucial element of value creation for carsharing operators lies in their agreements with municipalities. As highlighted by the interviewee from "Agenzia Roma Servizi per la Mobilità" (see Industry overview), municipalities play a significant role by designing the tender to which operators apply, setting the rules regarding minimum operating area, fleet size, electrification percentage, fees, and access to restricted zones. Operators can offer benefits such as free blue stripe parking, access to limited traffic zones (LTZs) and dedicated parking because they pay fees to municipalities: "...These benefits are key to instill a change in consumers' behavior and adopt carsharing services instead of private cars" (Corrente)".

This applies not only to free-floating operators but also to station-based operators who need permission to use dedicated parking spaces for their services.

Furthermore, as part of strategic agreements, many operators establish partnerships with other companies, particularly airport operators or transportation companies operating extensive railway networks, to secure strategically located parking spaces. This allows operators to enhance their territorial coverage and position themselves as a convenient "last mile" solution.

Additionally, some operators target corporate mobility by offering carsharing as a mobility solution for employees. This approach diversifies their revenue streams by incorporating a business-to-business (B2B) segment.

Finally, a crucial partner for carsharing operators is the industry trade association, Assosharing, mentioned multiple times during the interviews. The association comprises major companies in the sector (Enjoy and Share Now included) and strives to provide proposals to public authorities to enable the organic growth of sharing mobility modes. Among the key initiatives advocated by the association are the reduction of VAT taxation from 22 to 10% and the elimination of fees imposed by municipalities to carsharing operators.

The second block of interest is **key activities and processes**, which encompasses business model innovation. Through the analysis of multiple cases, each carsharing company emerged with some unique value creation and delivery elements:

- Enjoy stands out by incorporating battery swap technology into its fleets, introducing innovative processes for more sustainable mobility.
- Share Now emphasizes international integration, offering a seamless experience across different geographical locations.
- e-Go Drivalia has developed proprietary hubs for vehicle recharging, enhancing convenience for users.
- Corrente sets itself apart by implementing distinct operating area rules, enabling users to travel between cities.

- E-Vai differentiates itself by adopting a station-based configuration, facilitating interconnectivity between large and small municipalities throughout Lombardy.

Innovation within the carsharing industry provides a viable pathway for operators to differentiate themselves and establish a sustainable competitive advantage.

Another enabling element is the supply of vehicles for fleets through long-term rental contracts, providing operators with flexibility in adapting their vehicle offerings to meet evolving customer demands. For instance, Share Now has adjusted its fleet composition by replacing compact vehicles with SUVs to accommodate the market's trending preference for longer rental durations and higher mileage (see industry overview). Additionally, rental companies facilitate regular vehicle renewals, enabling carsharing operators to maintain newer and more environmentally friendly fleets, which is an aspect often emphasized by operators as they promote their services as a form of sustainable mobility.

The last significant aspect in value creation dynamics is the block of **key resources, assets, and competencies**. Each carsharing operator featured in this study is affiliated with a corporate group: Enjoy is associated with Eni (Energy sector), Share Now with Stellantis (Automotive sector), Drivalia with CA Auto Bank (Automotive sector), Corrente with TPER (Transportation sector), and E-Vai with FNM Group (Transportation sector). The synergies derived from these affiliations often serve as enabling and differentiating factors in the market. For instance, Enjoy benefits from over 6,000 mobility hubs provided by Eni, used for recharging, refueling, battery swaps, and vehicle cleaning. Share Now and Drivalia acquire vehicles for their fleets at favorable prices through their respective holding companies operating in the automotive sector. On the other hand, carsharing services within transportation groups enjoy greater integration with LPT and provide access to locations beyond the well-established mobility hubs, particularly those situated outside railway stations.

Lastly, the integration of electric or hybrid vehicles emerges as an enabling factor, particularly when considering the target of reducing emissions (SDG 13.1). The inclusion of electric vehicles in carsharing fleets is viewed as a positive aspect, driven and mandated by municipalities. However, it also entails operational complexities and limitations, particularly regarding the operational area. A detailed discussion on this matter will be presented in the challenges section.

5.2.2 Value delivery elements

When it comes to **customer relationships**, one enabling element for carsharing operators, particularly evident in Corrente and E-Vai as subsidiaries of transportation groups, is the integration with LPT through the offer of bundled packages to subscribers of public transport services, aiming to provide an additional tool at a discounted price. This approach positions carsharing as an integrated solution to address the "last mile" transportation challenge for customers who already embrace sustainable mobility options, providing a seamless experience and thus aligning to the pursuit of SDG target 11.2.

In addition to that, the wide range of rental options provided by operators emerged as another enabling factor. Operators strive to meet various customer needs by providing offers that span different timeframes, including minute-based fees (for free-floating models), daily rates, weekly rates, and even monthly packages. Nevertheless, the pricing convenience associated with these rental options remains an open question, as highlighted in the previous section.

Moreover, respondents remarked the market trend anticipated in the industry overview related to operators' shift towards offering longer-term packages, which reflects a strategic move by operators to tap into new customer segments and provide more comprehensive mobility solutions: *"We are making a movement that is very similar to those who do leasing or medium-short term rental today... those of us who have always been on the minute are trying to move toward the day, the week, the month... [whereas] those who have always been on the month are trying to go to the week, the day. I believe that we will find ourselves in 2024/2025 all of us on the day/week/month subscription"* (Enjoy). This shift towards longer rental options also entails the introduction of monthly packages, as exemplified by Corrente's offering of "Corrente Plus," which provides customers with extended access to a vehicle from a week to a month.

Among mentioned strategies aimed at creating customer lock-in and enhance loyalty, one is the implementation of a cashback model, as observed in the case of Corrente: by providing customers with driving credits equivalent to a portion of their expenses, Corrente fosters a sense of value and reciprocity, rewarding customers for utilizing their service and encouraging them to keep using it.

Another example from Share Now is the implementation of a loyalty program, which draws on the principles of gamification. By offering customers the opportunity to accumulate points and progress through different levels, Share Now creates a sense of achievement and rewards customers for their continued engagement.

Marketing communication also play a crucial role in carsharing promotion: for example, Enjoy promotes the economic convenience of their service on daily tariffs by directly displaying it on the cars.

Narrowing to **distribution channels**, most carsharing operators have adopted a multi-faceted approach to ensure the accessibility and visibility of their services. Alongside the conventional methods of placing cars throughout the city for free-floating services and designated parking areas for station-based services, operators established partnerships and agreements with companies and municipalities to position their vehicles in strategic locations. These strategic touchpoints encompass airports, train stations and metro stations, which serve as pivotal distribution channels where operators can capitalize on the high volume of customer traffic. Moreover, the close proximity of carsharing vehicles at airports and train stations enables users to effortlessly access them upon arrival or departure, facilitating a smooth transition between different modes of transportation. By strategically situating vehicles at these locations, operators not only provide ease of access to travelers but also facilitate seamless integration with LPT.

5.2.3 Positive external factors

External factors that positively impact the carsharing business and contribute to its alignment with SDG targets revolve around the emergence of new market opportunities. The respondents from the sample highlighted opportunities mainly in three areas:

- Increased customers' demand for extended rental periods.
- Development of MaaS4Italy.
- Development of new enabling technologies in adjacent industries, notably automotive and energy.

The emerging trend of extended rental times and distances related to free-floating models (see industry overview) is extremely relevant as it opens a new market opportunity for operators. All carsharing operators employing a free-floating model are actively striving to serve this emerging market segment, that respondents associated with a shift in consumer preferences towards using carsharing for longer trips.

Recognizing the changing demand patterns, operators responded by updating their offerings to provide more comprehensive solutions for extended rental periods, thus channeling an increasing demand toward these types of rentals. For instance, companies like Corrente with “Corrente Plus” offering and Enjoy with their daily rates displayed on the vehicles are adapting to match evolving customer need. Exploring this shift and its underlying factors could be an interesting topic for future research, as it would shed light on the evolving dynamics of consumer preferences and market demand in the carsharing industry.

MaaS4Italy¹⁰⁴ is an Italian government initiative that seeks to implement Mobility as a Service (MaaS), a global concept of integrated mobility. Through a single digital channel, MaaS integrates multiple public and private transportation services, including public transit, carsharing, bike sharing and taxis. The aim is to promote sustainable mobility against private car ownership.

The adoption of MaaS would bring numerous advantages, transforming mobility patterns and enhancing transportation accessibility through digital platforms. The aim is to provide simplified access to a wide range of mobility options, serving diverse user needs, promoting sustainable transportation usage and reducing reliance on individual vehicles thus mitigating traffic congestion and contribute to the target 11.2. Moreover, the integration of alternative means of transport to private cars would further pave the way toward the achievement of the SDG target 11.a.

In this scenario, carsharing operators would directly be part of the project as enabling partners. However, the respondent from Share Now – also a representative of Assosharing – expressed concerns regarding potential drawbacks of this solution as it: “...could lead to cannibalization and a loss of bargaining power, thus making it crucial to carefully consider the balance between achieving integration and safeguarding the interests of shared mobility services”.

¹⁰⁴ Dipartimento per La Trasformazione Digitale (2023), Mobility as a Service for Italy. Available online: [Link](#)

An integrated platform would foster competition, leading to improved service quality, which will force less strong players to leave the market.

Finally, carsharing operators benefit from innovations and new technologies from adjacent industries, mainly from the automotive and energy sectors.

Enjoy, through its partnership with XEV, is a pioneer in the carsharing industry, implementing innovative battery exchange technology that aligns with the principles of a circular economy. By embracing this circular model, Enjoy reaps multiple advantages in terms of charging efficiency. Instead of relying solely on traditional charging stations, the company employs battery swapping, allowing for the swift exchange of discharged batteries with fully charged ones in just a matter of minutes. This standardized approach not only increases the availability of vehicles ready for use but also keeps cars actively participating in the sharing ecosystem, promoting sustainable and uninterrupted mobility.

Carsharing operators are actively analyzing and eagerly awaiting other technological advancements, such as teleguided technology for remote vehicle movement, induction charging for electric fleets, and the development of biofuels to reduce environmental impact during refueling. The development of these technologies in adjacent sectors holds significant potential for carsharing industry, providing opportunities to enhance operational efficiency and effectiveness in creating and delivering value.

Upon completion of the analysis, it is now possible to compile the second component of the framework:

Business model elements and external factors for value creation and delivery

Value creation elements		Value delivery elements
Stakeholders & partners' network <ul style="list-style-type: none"> • Agreements with companies for reserved parking lots • Agreements with municipalities to obtain licenses for parking, dedicated parking lots and access to LTZs • Trade association to bring forward petitions to government for improved regulatory environment 	Key activities & processes <ul style="list-style-type: none"> • Business model innovation • Supply of cars under long-term rental agreements making procurement more flexible • Periodic renewal and maintenance of fleets to offer newest and most environmentally friendly cars 	Customer relationship <ul style="list-style-type: none"> • Bundles and promotions linked to the use of local public transport • Loyalty rewarding programs • Marketing communication to guide consumers towards embracing a sharing mindset • Wide-ranging rental options to meet different consumer needs
	Key resources, assets, competencies <ul style="list-style-type: none"> • Synergies with corporate group's competencies • Electric and hybrid cars in fleets 	Distribution channels <ul style="list-style-type: none"> • Strategic contact points with dedicated parking lots (airports, train stations...)
Emergence of new market opportunities <ul style="list-style-type: none"> • Development of MaaS4Italy for better integration with other transport modes alternative to private mobility • Increased customers' demand for extended rental periods • Development of new enabling technologies in adjacent industries (automotive and energy) 		

Source: personal elaboration

The second sub question of the research at hand can now be answered based on the evidence gathered from interviews and the thematic analysis conducted by the author:

SQ2: *What are the key business model elements and external factors that support Italian carsharing operators in creating and delivering value?*

Carsharing operators build their business models around key elements to create and deliver value to their customers, trying to propel a shift of consumers' mindset from ownership to sharing.

In terms of value creation, agreements with businesses and municipalities are crucial, as they provide benefits such as free parking in strategic locations and access to LTZs. Active participation in industry associations, like Assosharing, also plays a significant role in obtaining additional advantages and lobbying. Key activities, such as business model innovation and vehicle supply through long-term rental agreements, enable operators to create value aligned with the SDGs. This includes periodic vehicle renewal to maintain a modern and environmentally friendly fleet, as well as the electrification of the fleet to reduce emissions. Operators also focus on finding innovative ways to engage consumers and make the service more affordable, further enhancing the value created.

In terms of value delivery, operators offer several rental options to meet different customer needs. Bundling carsharing services with public transportation options fosters integration and provides a seamless travel experience. Additionally, operators implement rewarding programs to encourage customer loyalty and lock-in, further driving adoption and creating value for consumers.

Finally, according to interview findings, carsharing operators benefit from three main external factors: (1) the emergence of a new market segment demanding for longer rentals (2) the development of MaaS, which will ideally drive the harmonious integration of sustainable transports and (3) innovations in the adjacent automotive and energy markets, enhancing process efficiency and fostering an increased effectiveness in creating and delivering value.

5.3 Challenges in value capture dynamics

In this final section, the challenges emerged from the interviews currently affecting the ability of carsharing operators to capture value and generate profit from their activities will be examined. These challenges have been grouped by the author into four main categories: difficulties in business and operations' management, consumer-related issues, infrastructural constraints and contingent factors and obstructive local administrations' policies. The author has identified each challenge as either increasing costs or decreasing potential revenues:

Challenges to carsharing operators hindering value capture dynamics

Aggregate challenges	Challenges	Increase costs	Decrease potential revenues
Difficulties in business and operations' management	Complex car logistics, refueling/recharging and technical downtime management	×	
	Vandalism and abuse of vehicles	×	
	Poor density and number of cars in carsharing fleets		×
	Different cities and needs require different strategies	×	
Consumer-related issues	Consumers' range anxiety linked to the use of electric vehicles for longer trips		×
	Dissatisfaction related to mobile apps		×
	Price is perceived as a barrier to adoption by consumers		×
Infrastructural constraints and contingent factors	Scarce ubiquity and number of electric charging infrastructure in the territory		×
	Rising energy prices resulting from the war-related energy crisis in Ukraine	×	
	Vehicles' delivery delays and spare parts' scarce supply due to the closure of Asian borders	×	
	Negative externalities related to the emergence of micromobility as a solution for short distances		×
Obstructive local administrations' policies	Municipalities do not consider carsharing par to other alternatives to private car (higher taxation than LPT, imposed per-car fees and electrification of fleets)	×	
	Slow and bureaucratic procedures of local administrations		×
	Scarce evidence of policies to discourage private car use and make local public transport more efficient and effective		×

Source: Personal elaboration

In the subsequent sections each challenge will be explored in more detail.

5.3.1 Difficulties in business and operations' management

The first set of challenges pertains to the difficulties in managing the day-to-day operations of carsharing businesses.

One primary obstacle faced by carsharing operators is the logistical management of their fleets. Free-floating operators, particularly those with non-electric fleets that perform activities in a wider area, commonly experience the centrifugal effect at the end of the day, resulting in fewer available vehicles in the city center as they tend to disperse outward. This necessitates significant efforts and resources for vehicle relocation. However, innovative solutions like teleguided technology, as discussed in the previous section, could potentially alleviate this challenge by enabling remote vehicle movement.

Moreover, electric carsharing operators face the challenge of recharging vehicles, which is a time-consuming process that often needs to be done slowly to preserve battery lifespan, as noted by Mr. Astolfi of Corrente. The unavailability of vehicles during the charging process is further compounded by those vehicles undergoing maintenance due to technical issues, referred to as "technical downtime" by Drivalia's respondent, underlining that: "...operators can only generate revenue when vehicles are in use, making this maintenance process a significant challenge". It becomes even more complex for operators covering large areas, such as Corrente and E-Vai, due to the extensive geographic spread of their operations. These considerations converge toward increased operating costs for operators.

Vandalism and abuse of vehicles is another key challenge. Particularly in less supervised areas, many operators face issues of vehicle damage, including cases where vehicles are dismembered or set on fire, as reported by Enjoy and Share Now. Although these incidents may be relatively infrequent, they result in substantial increases in repair costs or the need to cover deductibles to rental companies.

For operators covering multiple cities, an added challenge is the need to customize their activities for each individual city. As aptly described by Mr. Rovatti (Enjoy): "*...each city has its own dress that requires a tailor to sew tailor-made clothes*". This metaphor emphasizes the necessity of adopting different organizational structures and strategies to meet the unique characteristics of each city. Tailoring operations to suit specific contexts increases the costs associated with reduced economies of scale in planning and strategy, as standardization becomes impractical.

Lastly, a significant challenge in the carsharing industry in Italy, as highlighted in the industry overview, is the limited size of the carsharing fleet compared to the private car fleet that hinders and limits operations. The impact of reducing private car ownership is hampered by a fleet that fails to serve a substantial percentage of users in the region. In 2021 the carsharing fleet consisted of 6.643 vehicles that is minuscule compared to the 38.5 million private cars in the country, especially when contextualizing the analysis in Italy, which has the highest motorization rates in Europe second only to Luxembourg. Mr. Rovatti exemplified: "*...in a city like Rome, a fleet of 20,000 carsharing vehicles would be necessary to make a substantial impact, whereas we only have fewer than 400*". This disparity serves as a wake-up call, emphasizing the urgent need for investment and policy intervention. The limitation of fleet size translates into a decrease in revenue potential, considering the significant pool of customers' demand that is not being reached due to this constraint.

5.3.2 Consumer-related issues











The challenges related to consumers are relatively few but have a significant impact on the perception of carsharing as a viable sustainable mobility solution. If consumers encounter barriers to adoption and choose not to use the service, the potential contribution of carsharing to sustainable mobility diminishes.

As mentioned earlier in the industry overview, Italy currently has a low number of recharging points compared to other major European countries, with only 6.1 recharging points per 100 km. This inadequate charging infrastructure presents a significant challenge and contributes to range anxiety among carsharing users, particularly those who require longer commutes. Recognizing this issue, carsharing operators like E-Vai, who primarily operate with 100% electric fleets, are incorporating hybrid vehicles into their offerings as a way to alleviate range concerns. However, this compromise in vehicle options hinders the potential contribution to SDG 13.1, as hybrids emit higher exhaust emissions compared to fully electric vehicles. To address this challenge and promote sustainable mobility, a nationwide plan for widespread installation of charging stations is necessary to improve the charging infrastructure across Italy.

Furthermore, price is currently a barrier to adoption. It is crucial for carsharing operators to meet the pricing expectations of their customer base, which values seamless user experience and affordable pricing. According to Drivalia’s respondent: “...the pricing strategies implemented by early operators have shaped customer expectations, leading to a continuous demand for lower fees”.

A sentiment analysis was conducted by the author on customer reviews of interviewed carsharing operators’ mobile apps (translated from Italian to English language) to gather further information about this challenge. By leveraging artificial intelligence, the author analyzed the sentiments expressed by consumers in their comments on popular platforms like Android and iOS. This approach yielded valuable insights into consumer perceptions and experiences, aiding in understanding their needs and preferences.

Sentiment analysis of sample Italian carsharing operators’ mobile app reviews

Carsharing	App Stores	Reviews Count	Average Review Stars	Sentiment Analysis			
				Positive	Neutral	Mixed	Negative
		570	1.9 ★ ★ ☆ ☆ ☆	9%	6%	4%	81%
		448	1.8 ★ ★ ☆ ☆ ☆	10%	4%	3%	83%
		171	1.8 ★ ★ ☆ ☆ ☆	44%	11%	16%	29%
		6,254	1.9 ★ ★ ☆ ☆ ☆	14%	4%	4%	78%
		32,855	3.4 ★ ★ ★ ☆ ☆	49%	7%	5%	39%

Source: Personal elaboration

The results of the sentiment analysis reveal a predominance of negative comments, which aligns with the low ratings of apps on the digital stores. Building upon this analysis, the author identified the top five recurring macro themes found in the customer comments, which provided valuable insights into the areas that commonly generate dissatisfaction or concerns among users¹⁰⁵.

¹⁰⁵ To perform the analysis, keyword matching was employed to associate customer reviews with the relevant topics. This involved comparing the content of the reviews with a predefined list of keywords related to each topic, ensuring that reviews containing those keywords were categorized accordingly.

Topics and keywords:

Bugs: Technical issues or errors that disrupt app functionality – *keywords: bug, crash, error, glitch, malfunction*

Design & UX: Visual design and user experience of the app – *keywords: design, aesthetics, layout, navigation*

Pricing: Comments related to tariffs and pricing – *keywords: price, pricing, fee, tariff, bundle, cost*






Advertising: Marketing strategies to promote the app – *keywords: advertising, promotion, social media, ads, communication*

Customer support: Assistance and service provided to users – *keywords: support, assistance, help, customer service, feedback*

Performance: App responsiveness, stability, and efficiency – *keywords: performance, responsiveness, stability, battery usage*

Usability: Ease and effectiveness of app use – *keywords: usability, navigation, task, interface, adaptability*

Top 5 topics from customer reviews on mobile apps leading to dissatisfaction

Carsharing	Top 5 topics (% match on total reviews)				
	#1	#2	#3	#4	#5
	Bugs (35.4%)	Design & UX (17.7%)	Pricing (15.1%)	Advertising (12.8%)	Customer support (11.2%)
	Bugs (36.6%)	Advertising (16.7%)	Pricing (16.5%)	Customer Support (16.1%)	Design & UX (15.0%)
	Bugs (31.0%)	Pricing (23.4%)	Performance (19.3%)	Customer Support (17.0%)	Design & UX (16.4%)
	Bugs (28.4%)	Performance (10.6%)	Design & UX (9.6%)	Advertising (8.8%)	Pricing (8.0%)
	Design & UX (17.1%)	Bugs (13.5%)	Performance (9.4%)	Usability (9.2%)	Pricing (8.3%)

Source: Personal elaboration

Each topic is associated with a "sentiment bar," which predominantly shows negative sentiments thus indicating a widespread dissatisfaction with carsharing applications, primarily due to issues such as bugs, poor design affecting the user experience, inadequate customer support, slow performance, and difficulties in app usage. The analysis also reveals high level of dissatisfaction specifically related to pricing, a significant barrier to adoption.

This finding is in line with the earlier ICS study, which emphasizes the persistent issue of affordability in the carsharing industry, which serves as the fourth precondition for carsharing operators to make a meaningful contribution for a more sustainable urban mobility. Operators need to leverage available resources to enhance adoption or explore avenues to further lower prices. The current circumstances do not allow for immediate adjustments, leading operators to seek support from stakeholders like Assosharing to mitigate the financial impact of government and municipal policies and stabilize their financial situation, which is currently unstable for most operators. These dynamics, characterized by pricing issues and low user satisfaction with the app, hinder the operators' ability to capture value. As a result, operators experience reduced revenue potential from that customer base who have previously used the service but remained dissatisfied, as well as from those who have been deterred by the high prices, leading to non-adoption.

5.3.3 Infrastructural constraints and contingent factors

The following challenges stem from the inadequate availability of charging stations across Italy and other contingent factors in the carsharing sector, including disruptions in the automotive and energy industries, as well as the emergence of shared micromobility options.

The limited availability of charging infrastructure poses a direct impact on the financial viability of electric carsharing businesses, besides leading to range anxiety for consumers. Firstly, the limited availability of charging stations leads to delays in charging vehicles, particularly in those areas where

energy demand is higher than supply. This results in extended periods of vehicles' downtime, reducing potential revenue opportunities for operators. Secondly, increasing the number of electric vehicles would further intensify the already high demand for energy, if unmatched with a corresponding increase in supply. Consequently, this limitation constrains the scalability of electric carsharing services and hampers operators' ability to capture a larger market share.

However, some operators in the sample proactively reacted to solve this issue. Drivalia and Corrente utilize proprietary mobility hubs, such as Drivalia Mobility Stores and strategically located hubs, to facilitate vehicle charging. E-Vai, on the other hand, benefits from its station-based business model, which includes dedicated charging stations in parking lots where consumers can plug in the vehicles themselves.

From the interviews, the Covid-19 pandemic and the conflict in Ukraine emerged as contingent factors to carsharing industry that afflicted profitability of businesses, as discussed in the industry overview. The closure of China's borders due to Covid-19 restrictions has caused delays in vehicle deliveries, creating uncertainties for carsharing operators, as highlighted by Mr. Astolfi (Corrente): *"Unfortunately, to date, we are in a position to be able to reserve vehicles but with lead times of 12 to 18 months ... [and] that in the rapidly evolving EV market, a mere six-month timeframe can witness significant changes, causing plenty of uncertainty"*. Additionally, the conflict in Ukraine has caused shortages of raw materials, rising prices and energy costs¹⁰⁶, further hindering profitability particularly for electric carsharing operators.

These factors, along with increased supply costs, have put financial pressure on the carsharing industry, especially for operators without direct ties to automotive groups. The Ukrainian conflict has exacerbated existing supply chain issues and adversely affected the profitability of the carsharing business.

Finally, the emergence of shared micromobility, such as scooters and bicycles, has added to the challenges faced especially by free-floating models. Interviews revealed that the increasing popularity of micromobility options may have reduced the demand for short-distance rentals, which has always been the core market segment for free-floating models, thereby decreasing potential revenues from that market segment. As a result, operators have had to adapt by exploring new market opportunities such as daily or longer-term rentals. However, further research is needed to establish a causation link between these phenomena.

5.3.4 Obstructive local administrations' policies

The translation of political intentions into administrative actions is crucial for the implementation of carsharing services.

Respondents from E-Vai pointed out that municipalities' bureaucratic processes often lead to slow decision-making and prolonged negotiations, resulting in significant time delays which can range from 9

¹⁰⁶ AGI (2022). La guerra ridurrà la produzione di auto nel mondo di 2,6 milioni di unità. Available online: [Link](#)

to 24 months. This bureaucracy not only discourages carsharing operators from establishing in new municipalities, but also leads to a loss of potential revenue linked to the demand in these areas.

Additionally, non-electric carsharing operators, like Enjoy and Share Now, encounter challenges imposed by municipalities that levy fees per vehicle. For instance, Rome municipality (see appendix) mandates a transition to electric fleets and provides exemptions or reduced fees specifically for electric cars. This poses challenges for carsharing operators that rely on internal combustion engines (ICE) and hybrid vehicles, particularly those operating under a free-floating model that requires a larger fleet to support operations. These operators also bear higher costs from per-car fees imposed by municipalities, which can potentially put them at a competitive disadvantage. According to Mr. Ciuffini (OSM), the current policy approach is not conducive to the growth of the “stagnating carsharing industry”. He suggests that a more effective strategy would involve implementing a policy focused on establishing grounded charging stations, which could yield better results.

Additionally, carsharing contend with a higher VAT taxation rate compared to LPT, which is incentivized by the Government. Assosharing advocates for carsharing to be recognized as a sustainable mobility solution on par with LPT, emphasizing its potential to integrate with alternative modes and contribute to urban sustainability. The current policies implemented by cities increase costs for carsharing operators. For further details, the appendix includes the specific conditions set by Rome, Milan, Florence, Bologna, and Turin for free-floating carsharing services.

Mr. Ciuffini (OSM) further suggested that municipalities should establish policies that make private car usage less convenient, thereby increasing the competitive advantage of alternative modes of mobility and foster the efficiency and effectiveness of these means of transport. By implementing a coordinated maneuver that discourages private car usage and provides a reliable, efficient, effective and integrated alternative, the path towards sustainable mobility can be significantly streamlined. Aligning policies and initiatives to promote alternative modes of transportation to private cars would not only facilitate the transition to sustainable mobility but also enhance the value capture dynamics of shared mobility providers. This, in turn, would enable them to invest more, establish themselves in the market, and create a virtuous cycle that transforms their “potential” contribution to sustainability into a “tangible reality”.

Upon completion of the analysis, it is now possible to compile the last component of the framework:

Challenges in value capture dynamics

Value capture dynamics			
Cost structure		Revenue model	
Challenges			
<ul style="list-style-type: none"> Difficulties in business and operations' management <p>^ Costs v Revenue potential</p>	<ul style="list-style-type: none"> Consumer-related issues <p>v Revenue potential</p>	<ul style="list-style-type: none"> Infrastructural constraints and contingent factors <p>^ Costs v Revenue potential</p>	<ul style="list-style-type: none"> Obstructive local administrations' policies <p>^ Costs v Revenue potential</p>

Source: Personal elaboration

The third sub question of the research at hand can now be answered based on the evidence gathered from interviews and the thematic analysis conducted by the author.

SQ3: *What are the challenges currently hindering the value capture dynamics of Italian carsharing operators?*

Interviews conducted with the sample of Italian carsharing operators, together with insights from the sample of stakeholders and sentiment analysis performed by the author on carsharing mobile apps' reviews, highlighted four main groups of challenges.

The first group of challenges pertains to the operational management of the carsharing service, particularly relevant for free-floating operators. Complex car logistics, refueling/recharging, and technical downtime management, as well as issues of vandalism and vehicle abuse contribute to increase operational costs. Additionally, the diverse needs and characteristics of different cities require tailored strategies, further complicating strategic and operational management. Limited density and size of carsharing fleets also hinders the potential for revenue generation, considering that a portion of customers' demand cannot be satisfied due to this structural constraint.

The second group of challenges involve consumer-related issues, which act as barriers to carsharing adoption and hinder the capture of potential revenues from untapped demand. A notable challenge that electric carsharing operators encounter is consumers' range anxiety, particularly when it comes to using electric vehicles for longer trips. This concern becomes even more significant as the entire carsharing sector is shifting towards a market segment demanding longer rental periods. Additionally, the sentiment analysis of mobile carsharing app reviews conducted by the author revealed consumer dissatisfaction with the user experience, citing issues with usability and a perceived high price point as barriers to adoption. To address these challenges, carsharing operators must explore strategies to enhance their offerings, reduce costs, and potentially lower prices to attract a larger consumer base.

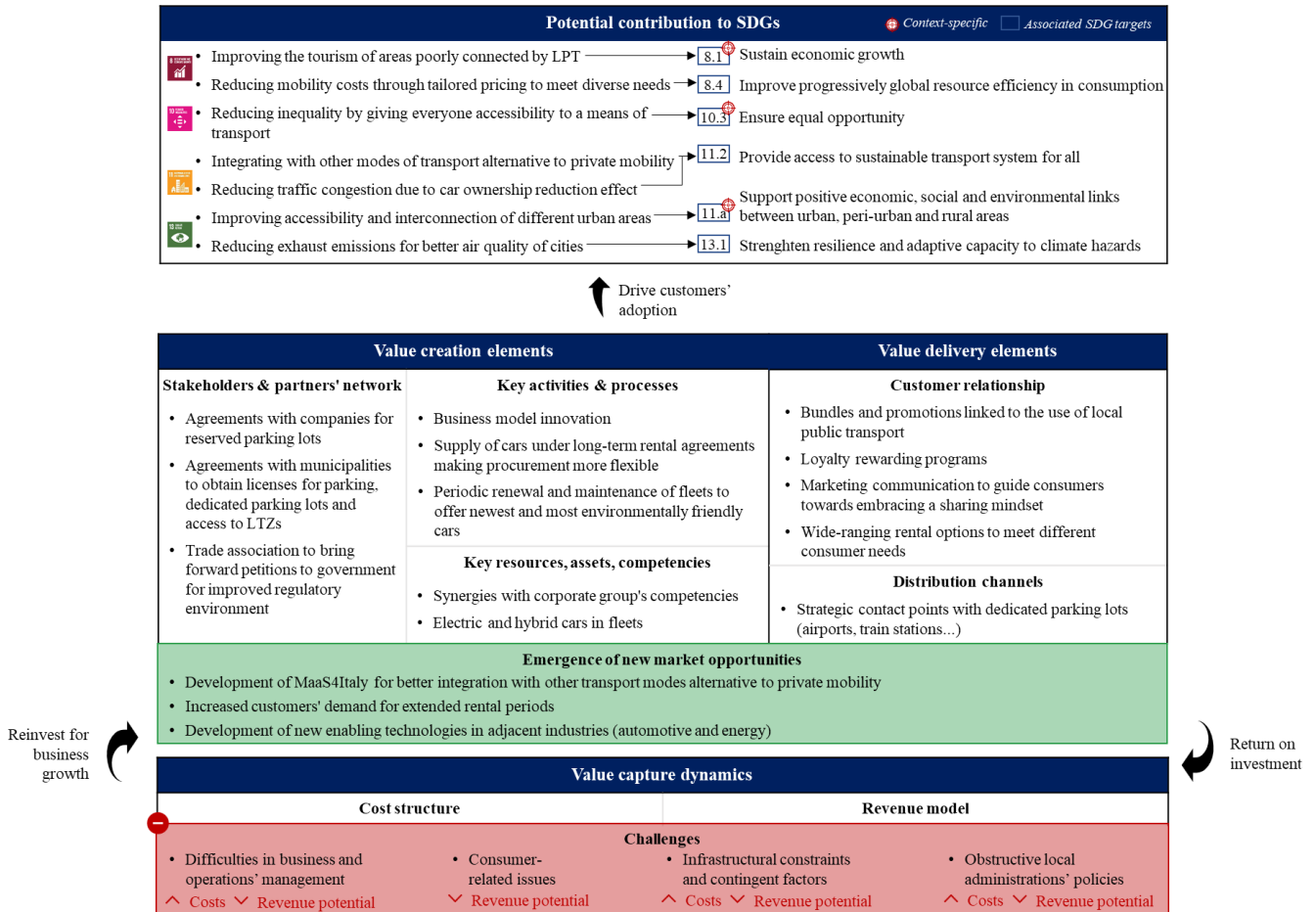
The third set of challenges includes limited charging station coverage, that restricts the expansion of electric fleets to avoid further operations' management difficulties and causes loss of potential revenues from untapped demand, and contingent factors that contribute to increase costs, such as crises in the automotive and energy sectors related to Covid-19 pandemic and the Ukrainian war, by increasing delivery time for vehicles' supply and disrupting the whole supply chain. Also, interviews revealed that the increasing popularity of micromobility options, such as scooters and bicycles, has added to the challenges faced especially by free-floating models. It may have eroded carsharing demand for short-distance rentals, which has always been the core market segment for free-floating models, thereby decreasing potential revenues from that market segment demand. As a result, operators have had to adapt by exploring new market opportunities such as daily or longer-term rentals.

The last group of challenges stems from obstructive policies of local governments. First, slow and bureaucratic procedures impede service expansion in new areas, limiting potential revenue from untapped demand. Moreover, some municipalities fail to recognize carsharing par to LPT, imposing per-vehicle fees and pushing for fleet electrification in an unfavorable EV market situation. Further worsening the situation is the unequal taxation compared to public transport that carsharing businesses have to bear, with a VAT rate of 22% versus 10% for LPT, which creates an additional obstacle to their value capture dynamics. Lastly, there is lack of policies that actively discourage private car usage, bolster the competitive advantage of alternative transportation modes and enhance the efficiency of LPT, which are vital for fostering a more sustainable urban mobility “ecosystem”.

CONCLUSIONS

In this concluding section, the framework's components, filled with findings presented in the previous chapter, can be integrated to offer a clear and comprehensive representation of the interrelationships among the three research areas.

Comprehensive findings framework



Source: Personal elaboration

Therefore, by establishing connections between framework components, the primary objective of this research can be successfully accomplished by providing a conclusive answer to the main research question:

RQ: *Can B2C carsharing operators effectively support the sustainable development of urban mobility in Italy?*

Yes, at present, carsharing operators definitely hold the potential to support the sustainable development of urban mobility, but their contribution is limited as the sector they operate in is going through a deep crisis, which results from barriers and challenges that do not allow them to have adequate economic return for reinvesting profits, improving service quality, fostering business growth and driving customers' adoption. This study shed light on both the future potential and current limitations of carsharing, focusing on B2C free-floating and station-based configurations.

First, the SDGs that carsharing operators can potentially contribute to have been identified: four goals and six specific targets related to economic growth, equal opportunities, sustainable cities and communities and climate action. Three targets – 8.4, 11.2, 13.1 – are strictly related to carsharing car ownership reduction potential, by enabling greater movement of people with fewer cars, thus aiming for traffic congestion and CO₂ equivalent emissions reduction in cities. This evidence reaffirms the underlying principles of the SPSS theory, which advocates for a sustainable business model that maximizes output while minimizing inputs. Moreover, the remaining targets – 8.1., 10.3, 11.a – are applicable exclusively within context-specific instances, where operators deploy electric fleets or when carsharing models are utilized as a "last mile" solution, thus enhancing the connectivity of urban areas and offering economic advantages to regions with restricted access to public transportation.

Second, key business model elements and positive external factors that consolidate operators' value creation and delivery dynamics have been identified. Value is mainly created by forming partnerships, exploiting flexible cars' procurement, innovating the business model and leveraging synergies. Value is then delivered to customers through tailored offerings, customers rewarding mechanisms and strategic parking lots. External factors such as emergence of new market segments, MaaS development, and innovations in adjacent sectors (automotive and energy) further increase the opportunities to create more value for driving customers' adoption and foster a shift in people's mindset to embrace sharing over ownership. However, despite the presence of these enabling factors, carsharing operators struggle to reach an economic balance, often barely covering their costs thus leading to low profit margins.

The research uncovered several challenges that further increase operating costs or limit potential revenue generation: difficulties in business and operations' management, consumers' dissatisfaction for mobile apps, pricing barriers, limited charging infrastructure, contingent crises and obstructive public administration policies. These challenges further prevent operators from effectively capitalizing on the value generated, resulting in limited opportunities for reinvestment and significantly impeding business growth. The financial sustainability of carsharing remains a significant issue for Italian operators, limiting their ability to invest in business growth, fleet expansion and service enhancements. Operators are trying to solve challenges related to business and operations' management and consumers by leveraging business model innovation. In the near future, carsharing businesses are expected to pursue diversification strategies to match greater demand across multiple segments – expanding the range of vehicle types beyond cars – and introduce new pricing formulas – e.g. new subscription models – to enhance economic convenience, thus increasing market share and business profitability. However, cohesive public policy intervention is crucial to ensure that these models effectively contribute to the sustainable development of urban mobility. Indeed, to unleash its full potential, carsharing must fit into a sustainable mobility "ecosystem", finding its identity in a harmonized integration with all the alternative transport modes to private mobility. First, government and local administrations must stimulate demand for sustainable mobility by improving the

effectiveness and efficiency of public transportation and fostering the integration of these sustainable mobility solutions to enable a shift in people's mindset away from private mobility. Second, it is crucial to establish the appropriate conditions that enable carsharing companies to expand their market share and effectively convert their potential contribution into actual impact. This involves creating a supportive regulatory framework, developing infrastructure and public policy initiatives that incentivize the sustainable mobility "ecosystem" over private mobility options. Finally, once the ecosystem is created, it becomes essential to implement measures that discourage private mobility to address the harm of congestion and pollution in cities.

Implications

This research aims to provide carsharing operators with "actionable" insights to help them understand which areas to focus on to generate greater profitability and enable business growth, highlighting the most important challenges that hinder adequate economic return from their activities. In addition, the research reveals the crucial role of incentive policies by public authorities in promoting carsharing as an alternative solution to private mobility. By presenting a clear and comprehensive overview of the current state of carsharing operators in Italy, this research aims to contribute to the decision-making process of public authorities in establishing favorable conditions and regulatory frameworks that support the growth and realization of carsharing's potential contribution to sustainable development of urban mobility.

Research limitations

One limitation of this study relates to the sample size of Italian carsharing operators. Given the relatively limited size of the carsharing industry in Italy, the author encountered difficulties in recruiting a larger sample of carsharing operators willing to contribute to the research with interviews. However, the author considers the research purpose fulfilled, as all research questions were comprehensively addressed. To enrich the research and provide alternative perspectives, the author also conducted interviews with stakeholders from OSM and "Agenzia Roma Servizi per la mobilità". Another limitation is that, except for E-Vai, only one representative from each company was interviewed. This could potentially limit the depth of investigation into the selected companies. However, the author believes that this factor did not negatively impact the research results. Despite having a single representative from each company, the interviews yielded detailed and extensive responses, enabling an in-depth analysis of carsharing business value dynamics. This is attributed to the fact that all interviewees held managerial positions and possessed significant experience and expertise in the carsharing industry. Lastly, the author acknowledges another limitation in the exclusion of P2P carsharing from the research. This decision was due to the economic model being still relatively immature in the Italian market, thus it would have been premature to assess its contribution to the sustainable development of urban mobility.

Future research

Additional research is required to delve into the car ownership reduction effect of carsharing in Italian cities, emphasizing the need for more quantitative and qualitative studies focusing on underlying causation links. Furthermore, it is crucial to conduct quantitative investigations that explore the correlation between the emergence of micromobility and the shift of free-floating models towards longer rental periods. The environmental impact of carsharing in urban context needs to be validated, particularly in terms of emissions reduction, within Italian cities, highlighting a promising avenue for future exploration. Finally, as the P2P carsharing matures its position in the industry, it becomes essential to conduct qualitative research to assess its potential contribution to the sustainable development of urban mobility in Italy. Such research would yield valuable insights into the specific advantages and challenges associated with P2P carsharing, and its role in promoting environmentally conscious transportation solutions.

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APPENDIX

Car ownership reduction through carsharing: substitution rates studies

Reference	Source	Sample	Location	Model	Results
Firn Korn & Müller (2011)	Survey	1881	Ulm (DE)	FF	Between 4.7% and 11.4% of FF carsharing users have one fewer car because of carsharing
6T-Bureau De Recherche (2014)	Online survey	1169	Paris (FR)	RT	Round-trip carsharing reduced number of private cars by 32%
Le Vine, Lee Gosselin, Sivakumar & Polak (2014)	Forecast	72	London (UK)	FF	3.5% less cars in London
Giesel & Nobis (2016)	Online survey	931	Berlin, Munich (DE)	FF	7% less car ownership
Nijland & van Meerkerk (2016)	Survey	363	NL	FF	30% less car ownership by users (selling)
Kolleck (2012-2017)	Car ownership, car registrations, carsharing	n/a	35 cities (DE)	FF	0.9-1.9 less car ownership for every FF shared car
Haustein (2017)	Online survey	493	Copenhagen (DK)	FF	9.7% less car ownership
Becker, Ciari & Axhausen (2017-2018)	Online survey, travel diary	960, 317	Basel (CH)	FF	6% less car ownership
Le Vine & Polak (2018)	Survey	347	London (UK)	FF	36% less car ownership
Wu, Le Vine, Clark, Gifford & Polak (2018)	Survey	4023	London (UK)	FF	23% less car ownership
Ceccato, Chicco & Diana (2019)	Interview	200	Turin (IT)	FF	20-36% less car trips
Mounce & Nelson (2019)	n/a	n/a	Global	FF	1:15 replacement ratio
CoMoUK (2020)	Survey	3463	London (UK)	FF	1:24 replacement ratio




Source: Personal elaboration

Deliberations of Rome, Milan, Turin, Bologna and Florence municipalities for free-floating carsharing






	 Rome	 Milan	 Turin	 Bologna	 Florence
Year	2023	2019	2022	2019	2020
Fleet composition	<ul style="list-style-type: none"> • PHEV • EV • HEV • MHEV *the fleet must be Euro 6	<ul style="list-style-type: none"> • PHEV • EV • HEV • Methane • LPG • Gasoline * from January 2024, only PHEV and EV inflections allowed	<ul style="list-style-type: none"> • PHEV (minimum range 50 km) • EV • EV L7 with battery swap (not new drivers) • HEV • Methane • LPG • Petrol *the fleet must be Euro 6	<ul style="list-style-type: none"> • categories M1, N1 or L7e referred to in art. 47 of the Highway Code *the fleet must be Euro 6	<ul style="list-style-type: none"> • PHEV • EV • HEV • Methane • LPG • Petrol *The fleet must be Euro 6
concessions	<ul style="list-style-type: none"> • ZTL access (subject to payment of rent) • free parking (subject to payment of rent) • EV do not pay rent • reduction of the operating area (max +50 kmq), up to zero 	<ul style="list-style-type: none"> • gradual reduction of the total rent up to 60% for ICE fleet (from 2024, only on EV fleet) for adding up EVs in the fleet • reduction of the operating area fee up to 30% • reduction of the fee on the application of the lowest rates (up to 10%) • reduction of the fee 10% for lowering rates by 10% 	<ul style="list-style-type: none"> • ZTL • free parking 	<ul style="list-style-type: none"> • ZTL • free parking • traffic permit in fleet lanes with Evs (EV only) 	<ul style="list-style-type: none"> • ZTL access (subject to fee) • free parking • 50% ICE fee reduction if operating area is extended to 4 municipalities
Fees	<ul style="list-style-type: none"> • HEV, MHEV - 2.400€ yearly per car • PHEV - 1.500€ yearly per car • EV - 0€ 	<ul style="list-style-type: none"> • ICEs - 100€ monthly per car (increases to 150€ from 2024) • EVs - 0€ monthly (40€ from 2024) 	<ul style="list-style-type: none"> • for the first 12 months of operation, rent 0€ • after the first year, rent calculated on the average number of annual rentals > 15: <ul style="list-style-type: none"> - 200€ yearly per ICE car - 100€ yearly per HEV car - 0€ yearly per EV car if <15: <ul style="list-style-type: none"> - 0€ per year 	<ul style="list-style-type: none"> • ICEs - 50€ monthly per car • HEVs - 25€ monthly per car • EVs - 0€ monthly per car 	<ul style="list-style-type: none"> • Gasoline - 300€ yearly per car for access in ZTL • Other ICE - 150€ yearly per car for access in ZTL • EVs - 0€ yearly per car for access in ZTL
Minimum service standards	<ul style="list-style-type: none"> • 24/7 service • operation service with vehicle availability always at 90% • minimum number of vehicles (PHEV, HEV, MHEV): 600 • minimum number of vehicles (EV): 200 • call center 24/7 • maximum EVs battery residual capacity 80% • minim operational perimeter (non-EV): 80 kmq • minim operational perimeter (EV): 60 kmq • real time vehicle monitoring • integration with maas • active service even without reservation • periodically renewed fleet (unspecified period) • customer satisfaction mandatory reporting • banned vehicles with 4+ years and 100,000 km of travel • vehicle insurance coverage 	<ul style="list-style-type: none"> • service 24/7 • operation service with vehicle availability always at 90% • minimum number of vehicles: 400 • call center 24/7 • minimum operating perimeter • 90% of vehicles in the fleet must be less than 450 cm • maximum batteries evs 80% • real time vehicle monitoring • active service even without reservation • banned vehicles with 4+ years and 100,000 km of travel • integration with maas • customer satisfaction mandatory reporting • vehicle insurance coverage 	<ul style="list-style-type: none"> • service 24/7 • operation service with vehicle availability always at 90% • call center 24/7 • active service even without reservation • customer satisfaction mandatory reporting • quarterly data sending • integration with maas • vehicle insurance coverage • periodically renewed fleet (not specified period) • minimum number of vehicles (EV): 100 • minimum number of vehicles (Other types): 200 	<ul style="list-style-type: none"> • fleet size: 100<x<500 • if fleet is 100% EV, minimum size: 50 • banned vehicles with 4+ years and 100,000+ km of travel • service operation with vehicle availability always at 90% • at least 2% of the vehicles in the fleet must guarantee travel for people with reduced mobility • minimum operating perimeter: 15 kmq (also "archipelago", with discontinuity on the territory, so-called areolas in peripheral areas) • guaranteed service for at least 300 days a year • active service at least 18 hours/dd • mandatory app/website • presence of a call center • vehicle insurance coverage • real-time vehicle monitoring and data reporting 	<ul style="list-style-type: none"> • service 24/7 • operation service with vehicle availability always at 80% • call center 24/7 • active service even without reservation • all-inclusive service of all costs (included in the rate) • insurance coverage vehicles • sending data • minimum fleet size ICE: 80 • minimum fleet size EV: 40 • banned vehicles with 100,000+ km travel • 80% of vehicles in the fleet must be less than 450 cm long
Other relevant info	<ul style="list-style-type: none"> • compulsory vehicles' sanitization 	<ul style="list-style-type: none"> • possibility to apply Bonus/Malus for accidents • allowed limitation to novice drivers 	<ul style="list-style-type: none"> • penalties for failure to fulfil obligations 	<ul style="list-style-type: none"> • arrangement of 20 stalls to park cars in the fleet • penalty for defaults 	<ul style="list-style-type: none"> • possibility to apply Bonus/Malus for accidents • 180 days from the start of activity to be within the parameters • municipality can request activation in areas identified in the municipalities of Florence and Prato (70% fleet remains available in the municipality)

Source: Personal elaboration from local administration deliberations

Interview guide - Italian carsharing operators

Areas of research	Questions													
Enabling business model elements and external factors	1. What specific elements of your business model or positive external factors foster the economic success of the business and drive consumers' adoption?													
Challenges	2. What challenges has your company faced or is currently facing? How were they addressed and what were the results?													
Potential contribution to SDGs	<p><i>"The Urban Plan for Sustainable Mobility (PUMS) is a strategic planning tool at the national level that, in the medium to long term, outlines objectives for environmental, social and economic sustainability in the urban areas of Italy's major cities, ensuring that the urban mobility system ensures that everyone can exercise their right to get around, while burdening the community to a minimum in terms of air pollution, noise, congestion and accidents."</i></p> <p>Moreover, it is possible to associate 5 Sustainable Development Goals (SDGs) for the United Nations 2030 agenda with the areas of interest of the PUMS and, consequently, with the related macro goals:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #1a3d4d; color: white;">Areas of Interest</th> <th style="background-color: #1a3d4d; color: white;">PUMS macro-objectives*</th> <th style="background-color: #1a3d4d; color: white;">SDGs</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> A) Effectiveness and efficiency of the mobility system </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> A1 Shifting the modal balance of mobility A2 Reduction of traffic congestion A3 Improving the accessibility of people and goods A4 Improving integration between the development of mobility system and spacial planning and development A5 Improving the quality of road and urban space </td> <td rowspan="4" style="vertical-align: middle; text-align: center;">  </td> </tr> <tr> <td style="vertical-align: top;"> B) Energy and environmental sustainability </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> B1 Reducing consumption of conventional fuels other than alternative fuels B2 Improving air quality B3 Reducing noise pollution </td> </tr> <tr> <td style="vertical-align: top;"> C) Safety of road mobility </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> C1 Reducing road accidents C2 Reducing social costs resulting from accidents </td> </tr> <tr> <td style="vertical-align: top;"> D) Socio-economic sustainability </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> D1 Improving social inclusion D2 Increasing citizenship satisfaction D3 Increasing employment rates D4 Reducing mobility costs related to the need of using private vehicles </td> </tr> </tbody> </table> <p style="font-size: small; margin-top: 5px;">*Macro objectives of areas of interest A) and C) have been reduced and to make the interview process more efficient</p>	Areas of Interest	PUMS macro-objectives*	SDGs	A) Effectiveness and efficiency of the mobility system	<ul style="list-style-type: none"> A1 Shifting the modal balance of mobility A2 Reduction of traffic congestion A3 Improving the accessibility of people and goods A4 Improving integration between the development of mobility system and spacial planning and development A5 Improving the quality of road and urban space 		B) Energy and environmental sustainability	<ul style="list-style-type: none"> B1 Reducing consumption of conventional fuels other than alternative fuels B2 Improving air quality B3 Reducing noise pollution 	C) Safety of road mobility	<ul style="list-style-type: none"> C1 Reducing road accidents C2 Reducing social costs resulting from accidents 	D) Socio-economic sustainability	<ul style="list-style-type: none"> D1 Improving social inclusion D2 Increasing citizenship satisfaction D3 Increasing employment rates D4 Reducing mobility costs related to the need of using private vehicles 	3. What are the macro goals, and consequently the SDGs, on which your business model imparts the greatest positive impact, either directly or indirectly?
	Areas of Interest	PUMS macro-objectives*	SDGs											
	A) Effectiveness and efficiency of the mobility system	<ul style="list-style-type: none"> A1 Shifting the modal balance of mobility A2 Reduction of traffic congestion A3 Improving the accessibility of people and goods A4 Improving integration between the development of mobility system and spacial planning and development A5 Improving the quality of road and urban space 												
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D) Socio-economic sustainability	<ul style="list-style-type: none"> D1 Improving social inclusion D2 Increasing citizenship satisfaction D3 Increasing employment rates D4 Reducing mobility costs related to the need of using private vehicles 													

Interview guide - Osservatorio Nazionale Sharing Mobility

Areas of research	Questions
Italian carsharing market overview	<p>1. An analysis of the numbers for the main B2C operating models in Italy shows that station-based carsharing is in stable recovery in the post-Covid 19 period, as opposed to free-floating, which is still struggling to recover pre-pandemic levels (i.e., fleet size, number of rentals, and mileage have more than halved compared to 2019). How do you explain this phenomenon?</p> <p>2. An analysis of carsharing adoption rates in Italy reveals an uneven distribution, with particularly low numbers in southern regions. From your perspective and experience, what factors contribute to the disparity in carsharing penetration rates in different Italian regions? Also, what are the main success factors of cities such as Milan, Rome, and Bologna that have experienced high adoption rates of carsharing services, and what are the main challenges facing cities where the surveyed numbers remain low or close to zero?</p>
Challenges	3. What challenges is carsharing currently facing?
Potential contribution to SDGs	<p><i>"The Urban Plan for Sustainable Mobility (PUMS) is a strategic planning tool at the national level that, in the medium to long term, outlines objectives for environmental, social and economic sustainability in the urban areas of Italy's major cities, ensuring that the urban mobility system ensures that everyone can exercise their right to get around, while burdening the community to a minimum in terms of air pollution, noise, congestion and accidents."</i></p> <p>Moreover, it is possible to associate 5 Sustainable Development Goals (SDGs) for the United Nations 2030 agenda with the areas of interest of the PUMS and, consequently, with the related macro goals:</p> <div style="display: flex; align-items: center; justify-content: space-between;"> <div style="width: 30%;"> <p>Effectiveness and efficiency of the mobility system</p> <p>A) effectiveness and efficiency of the mobility system</p> </div> <div style="width: 40%; border-left: 1px solid #ccc; padding-left: 10px;"> <p>A1 Shifting the modal balance of mobility</p> <p>A2 Reduction of traffic congestion</p> <p>A3 Improving the accessibility of people and goods</p> <p>A4 Improving integration between the development of mobility system and spacial planning and development</p> <p>A5 Improving the quality of road and urban space</p> </div> <div style="width: 20%; text-align: right;">      </div> </div> <div style="display: flex; align-items: center; justify-content: space-between; margin-top: 10px;"> <div style="width: 30%;"> <p>Energy and environmental sustainability</p> <p>B) energy and environmental sustainability</p> </div> <div style="width: 40%; border-left: 1px solid #ccc; padding-left: 10px;"> <p>B1 Reducing consumption of conventional fuels other than alternative fuels</p> <p>B2 Improving air quality</p> <p>B3 Reducing noise pollution</p> </div> </div> <div style="display: flex; align-items: center; justify-content: space-between; margin-top: 10px;"> <div style="width: 30%;"> <p>Safety of road mobility</p> <p>C) safety of road mobility</p> </div> <div style="width: 40%; border-left: 1px solid #ccc; padding-left: 10px;"> <p>C1 Reducing road accidents</p> <p>C2 Reducing social costs resulting from accidents</p> </div> </div> <div style="display: flex; align-items: center; justify-content: space-between; margin-top: 10px;"> <div style="width: 30%;"> <p>Socio-economic sustainability</p> <p>D) socio-economic sustainability</p> </div> <div style="width: 40%; border-left: 1px solid #ccc; padding-left: 10px;"> <p>D1 Improving social inclusion</p> <p>D2 Increasing citizenship satisfaction</p> <p>D3 Increasing employment rates</p> <p>D4 Reducing mobility costs related to the need of using private vehicles</p> </div> </div> <p style="font-size: small; margin-top: 10px;">*Macro objectives of areas of interest A) and C) have been reduced and to make the interview process more efficient</p> <p>4. What are the macro goals, and consequently the SDGs, on which carsharing imparts the greatest positive impact, either directly or indirectly?</p>

Interview guide - Agenzia Roma Servizi per la Mobilità

Areas of research	Questions
Role of the Agency	<p>1. What is the Agency's role in carsharing within the City of Rome?</p> <p>2. How does the interaction between private carsharing operators and the Agency take place?</p>
Policy	3. How does Rome municipality's policy toward carsharing differ from other major municipalities?

Thematic framework



1st Order concepts	2nd Order concepts	Aggregate Themes
Improving the tourism of areas poorly connected by LPT › <i>SDG 8.1</i>	SDG 8: Decent work and economic growth	Potential contribution to SDGs
Reducing mobility costs through tailored pricing to meet diverse needs › <i>SDG 8.4</i>		
Reducing inequality by giving everyone accessibility to a means of transport › <i>SDG 10.3</i>		
Integrating with other modes of transport alternative to private mobility › <i>SDG 11.2</i>		
Reducing traffic congestion due to car ownership reduction effect › <i>SDG 11.2</i>		
Improving accessibility and interconnection of different urban areas › <i>SDG 11.a</i>		
Reducing exhaust emissions for better air quality in cities › <i>SDG 13.1</i>	SDG 10: Reduced inequalities	Enabling business model elements and external factors
Agreements with companies for reserved parking lots › <i>stakeholders and partners' network</i>	SDG 11: Sustainable cities and communities	
Agreements with municipalities to obtain licenses for parking, reserved parking lots and access to LTZs › <i>stakeholders and partners' network</i>		
Trade association to bring forward petitions to government for improved regulatory environment › <i>stakeholders and partners' network</i>		
Business model innovation › <i>key activities and processes</i>		
Supply of cars under long-term rental agreements making procurement more flexible › <i>key activities and processes</i>		
Periodic renewal and maintenance of fleets to offer the newest and most environmentally friendly cars › <i>key activities and processes</i>		SDG 13: Climate action
Synergies with corporate group's competencies › <i>key resources, assets and competencies</i>	Value creation elements	
Electric and hybrid cars in fleets › <i>key resources, assets and competencies</i>		
Bundles and promotions linked to the use of local public transport › <i>customer relationship</i>		
Loyalty rewarding programs › <i>customer relationship</i>		
Marketing communication to guide consumers towards embracing a sharing mindset › <i>customer relationship</i>		
Wide-ranging rental options to meet different consumer needs › <i>customer relationship</i>		Value delivery elements
Strategic contact points with dedicated parking lots (airports, train stations...) › <i>distribution channels</i>		
Development of MaaS4Italy for better integration with other transport modes alternative to private mobility		
Increased customers' demand for extended rental periods		
Development of new enabling technologies in adjacent industries (automotive, energy)		
Complex car logistics, refueling/recharging and technical downtime management	Difficulties in business and operations' management	
Vandalism and abuse of vehicles		
Poor density and number of cars in carsharing fleets		
Different cities and needs require different strategies		
Consumers' range anxiety linked to the use of electric vehicles for longer trips		Consumer-related issues
Dissatisfaction related to mobile apps		
Price is perceived as a barrier to adoption by consumers		
Scarce ubiquity and number of electric charging infrastructure in the territory	Infrastructural constraints and contingent factors	
Rising energy prices resulting from the war-related energy crisis in Ukraine		
Vehicles' delivery delays and spare parts' scarce supply due to the closure of Asian borders (Covid-19 pandemic)		
Negative externalities related to the emergence of micromobility as a solution for short distances		
Municipalities do not consider carsharing par to other alternatives to private car (higher taxation than LPT, imposed per-car fees and electrification of fleets)		Obstructive local administrations' policies
Slow and bureaucratic procedures of local administrations		
Scarce evidence of policies to discourage private car use and make local public transport more efficient and effective		

Source: Personal elaboration from coding data

THESIS SUMMARY

INTRODUCTION

United Nations forecast an increase in people concentration within cities from 56% in 2021 to 68% in 2050¹⁰⁷, raising population density in urban areas that are increasingly qualifying as environments where people work, move and where life is regulated by streets' viability. Therefore, to meet the travel needs of a growing number of people concentrated in large urban centers and effectively tackle the ever-growing problem of congestion caused by moving cars parked private cars – that typically remain idle for 95% of their useful lifespan¹⁰⁸ –, urban mobility is expected to undergo profound changes in the next decade. First, traffic congestion resembles an economic problem, in terms of consumption of resources that cannot be replenished. Second, it is an environmental problem, because it generates negative effects in terms of pollutant emissions with repercussions on the health of the planet and the population. Third, it is a social problem because it seriously affects the quality of life and safety of citizens. Offering a solid alternative to private mobility is key to reduce the negative effects of traffic congestion.

The sustainable development of urban mobility is becoming one of the major topics of debate in local, national and international policies, unlocking new areas for business investment and innovation. Moreover, advancing sustainability in the mobility sector is definitely an opportunity to make progress towards the higher Sustainable Development Goals (SDGs) set by the United Nations in the Agenda 2030 to address the challenge of sustainability in its environmental, social and economic dimensions¹⁰⁹.

In this context, new business models have emerged, enabled by Sharing Economy and digitization. Among these, carsharing models offer a mobility service that, by grafting among all those solutions involving the shared use of a mobility asset, falls within the broader range of solutions to replace private mobility. In literature, carsharing is associated with the Shared-based Product-Service System (SPSS)¹¹⁰, a peculiar business model that integrates product with service to collectively meet customers' demands, thereby promoting efficiency in utilization.

In Italy, however, the carsharing sector has suffered a major setback after years of growth, raising uncertainty about what the potential contribution of these services to the sustainable development of urban mobility currently is, what elements of the business model and external factors enable the creation and delivery of value and what are the unsolved challenges that possibly caused the stagnation.

The purpose of this research is to conduct a thorough qualitative analysis through multiple-case interviews with existing and established Italian carsharing operators in the B2C segment – *Enjoy, Share Now, Drivalia, Corrente, E-Vai* – and key industry stakeholders – *Osservatorio Nazionale Sharing Mobility, Agenzia Roma*

¹⁰⁷ United Nations, Department of Economic and Social Affairs, Population Division (2019)

¹⁰⁸ Shoup, D.C. (2017)

¹⁰⁹ United Nations (2020)

¹¹⁰ Somers, L., Dewit, I., & Baelus, C. (2018)

Servizi per la mobilità –, and establish practical connections between the theoretical concepts of SPSS and sustainable development, specifically by linking carsharing to the SDGs, while offering “actionable” insights to carsharing operators and stakeholders in Italy by highlighting areas for improvement.

Based on this, the author has developed the following research question:

RQ: *Can B2C carsharing operators effectively support the sustainable development of urban mobility in Italy?*

To provide a comprehensive answer to the main research question, the researcher has developed the following sub-questions:

SQ1: *What Sustainable Development Goals do Italian carsharing operators potentially contribute to?*

SQ2: *What are the key business model elements and external factors that support Italian carsharing operators in creating and delivering value?*

SQ3: *What are the challenges currently hindering the value capture dynamics of Italian carsharing operators?*

1. LITERATURE REVIEW

The Sharing Economy (SE) is a growing trend that emphasizes sharing over ownership, connecting providers and users through technology platforms¹¹¹. It is driven by changes in consumer behavior, electronic market platforms, and the "app economy" enabled by digitization¹¹². SE facilitates the transition from product to service economy, contingent upon a necessary shift in consumers' mindset that prioritizes accessing goods rather than owning them. Alongside, companies must harness the power of digitization to shape efficient and sustainable business models.

This transition has paved the road to new opportunities for advancing sustainable development, which “...comprises types of economic and social development which protect and enhance the natural environment and social equity”¹¹³. This definition represents a shift to a comprehensive development beyond financial measures, preserving the environment's functions – environmental sustainability –, promoting global well-being – social sustainability – and focusing on resource efficiency and local development – economic sustainability. The growing attention to sustainability is gradually attracting the interest of most countries, businesses and individuals even with global maneuvers aimed at promoting it. In 2015 the 2030 Agenda for Sustainable Development was approved by the 193 constituent countries of the United Nations, where 17 Sustainable Development Goals (SDGs) were broken down into 169 targets and 240 indicators to be achieved by 2030¹¹⁴.

¹¹¹ Eckhardt, G. M. et al. (2019)

¹¹² Sundararajan, Arjun (2017)

¹¹³ Diesendorf, M., (2000)

¹¹⁴ United Nations (2020)

With the aim of pursuing sustainable development, new business models have emerged, including the Product-Service System (PSS) theorized by Tukker¹¹⁵, which entails new value dynamics by offering product as services, thereby generating value-in-use for customers¹¹⁶. The value offered by PSS depends on its configuration, that can be product-oriented – offering products with added services –, result-oriented – delivering predetermined results – and use-oriented – providing products' accessibility for use. SE pairs with use-oriented PSS¹¹⁷ enabling a new model: the Shared-based PSS (SPSS)¹¹⁸.

Companies that embrace the SPSS business model maintain ownership of products and offer them as shared services to collectively fulfill a specific customers' demand. This is achieved through asset sharing, leading to maximized consumption and minimized resource utilization.

In recent years, carsharing is a SPSS that gained widely-recognized attention due to its potential for sustainable development in urban mobility, conceived as a system that provides users with the benefits of both the product (car) and service (transportation). Carsharing comes in different forms that emerge from the combination of economic and operational models¹¹⁹. Economic models revolve around four factors: vehicle providers, temporary user access, party relationships, and transaction types. Among three identified models – business-to-consumers (B2C), peer-to-peer (P2P) and cooperative –, this study focuses on B2C, where operators own a car fleet and charge fees to consumers for temporary access¹²⁰.

Operating models relate to vehicle spatial distribution – proximity to demand, network distribution within a “station”, fixed or flexible node networks and no restrictions¹²¹ – and trip type – round-trip or one-way. The combination of vehicle distribution and trip type leads to three operating models: station-based round-trip, station-based one-way and free-floating one-way¹²². The B2C model can adopt any operating model and configuration. Station-based carsharing offers round-trip or one-way options with cars parked in reserved areas¹²³, while free-floating carsharing allows flexible parking within a defined release area¹²⁴. Both models are subject to economic balance. Operators have to bear direct costs – car acquisition, maintenance, and service management – and indirect costs – overall organization and management expenses –, while they generate revenues mainly from time-based fees (free-floating) and duration-distance-based rates (station-based)¹²⁵.

Both these carsharing models are designed to offer an alternative to private car ownership, allowing individuals to use shared vehicles for their trips. In literature, the "car ownership reduction" effect has been

¹¹⁵ Tukker, A. (2004)

¹¹⁶ Tukker, A. (2015)

¹¹⁷ Somers, L., Dewit, I., & Baelus, C. (2018)

¹¹⁸ Li, D., Huang, Y., Sun, H., & Zhi, B. (2021)

¹¹⁹ K. Münzel et al. (2019)

¹²⁰ Bauwens, M. et al. (2012)

¹²¹ Fondazione per lo sviluppo sostenibile et al. (2020)

¹²² Ibid

¹²³ Machado, C. A. S. et al. (2018)

¹²⁴ Fondazione per lo sviluppo sostenibile et al. (2020)

¹²⁵ Ibid

quantitatively investigated by regression models that seek for a correlation between the presence of carsharing and reduced motorization rates¹²⁶, but findings are often inconsistent. In some cases, the introduction of carsharing has been observed to influence purchasing behavior – selling previously owned vehicles, delaying car purchases, discouraging car ownership – and travel modes among adopters – e.g. more frequent use of public transportation, bicycling, walking –, potentially leading to reduced car ownership. The reduction effect varies between free-floating and station-based models, with the latter typically showing a greater effect: station-based models generally reduce car ownership by around 33%, while free-floating models ranges from approximately 2% to 23%¹²⁷.

The literature review exposes research gaps regarding the practical connection between sustainable development, sustainable business models and carsharing. Specifically, there is limited investigation into the contribution of Italian carsharing operators to SDGs, the value dynamics withing carsharing business models and challenges hindering value capture. These are the gaps that the present research aims to fill.

2. METHODOLOGY

This chapter delves into the decisions that were made regarding the nature and structure of the research, along with the techniques and methods used for collecting and analyzing the empirical data. This research entails a qualitative strategy and adopts a multiple-case research design. This structure is consistent with the author's aim to provide an analysis of different Italian carsharing operators to answer research questions. The primary data gathering was performed throughout semi-structured interviews with samples of Italian carsharing operators (7 respondents) and industry stakeholders (2 respondents) who acted as subject matter experts to better understand the dynamics of the sector. Both groups were selected by criterion sampling. Thematic analysis was employed in this study to ensure a reliable and rigorous analysis, following the “six-phase framework”¹²⁸. This research meets the criteria of trustworthiness and authenticity¹²⁹.

3. INDUSTRY OVERVIEW

Italy counts 38.5 million cars for private use¹³⁰, has the second-highest density of cars per 1,000 people in Europe after Luxemburg and a higher motorization rate than in other main European nations (Germany, France, Spain, UK) – 642 cars in Italy compared to an average of 553 in the other four¹³¹. When considering only driving aged people, Italians practically have more than one car each (on average)¹³². Moreover, Italy is well known for having the oldest vehicle fleet among the five major European markets, portending a

¹²⁶ The number of registered passenger cars per 1000 inhabitants.

¹²⁷ See appendix for further details on the studies considered for the literature review

¹²⁸ Clarke, V., & Braun, V. (2013)

¹²⁹ Guba, E. G., & Lincoln, Y. S. (1994)

¹³⁰ Automobile Club d'Italia (2021)

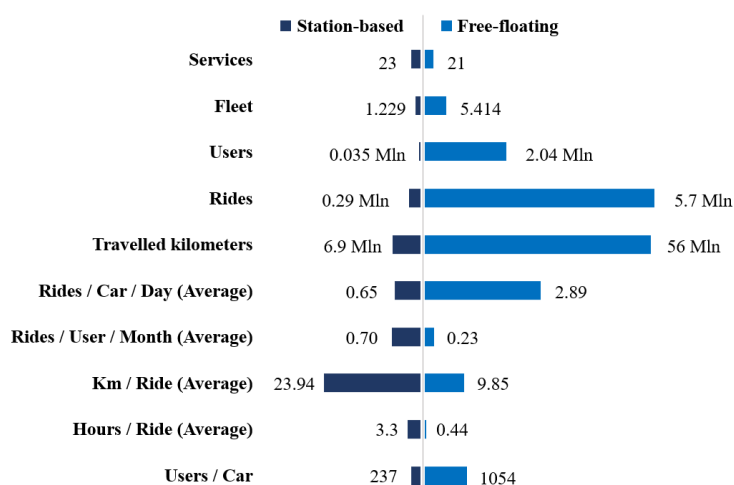
¹³¹ UNRAE (2022)

¹³² Elaboration on World Bank, ISTAT data.

"Cuba Effect"¹³³. Carsharing can be a potential solution as it seeks to maximize car use and decongest urban roads by moving more people with less cars. The European Environment Agency considers shared mobility essential in the shift to a low-carbon economy¹³⁴.

In 2021, according to OSM estimates, the Italian carsharing market was worth in terms of turnover about €61.8 million, where free-floating carsharing absorbed about 90% market share - €55.5 million - and station-based the remaining 10% - €6.3 million -, immediately highlighting a great disparity in market size and turnover between these two models¹³⁵. Due to the different nature of the services, also the order of magnitude of the numbers greatly differs.

Comparison of free-floating and station-based carsharing in Italy (2021)



Source: Personal elaboration from OSM data

First striking fact is that the dimension of carsharing fleet in Italy as of 2021 – 6631 cars – is significantly smaller compared to the 38.5 million vehicles registered for private use. Despite the limited fleet size, carsharing services can bring higher electric penetration rates to market (around 27%) compared to private cars (0.2%).

Overall, free-floating models show higher numbers compared to station-based models, except for travelled kilometers per ride (average) – 9.85 (free-floating) vs 23.94 (station-based). At the level of spatial distribution, free-floating carsharing continues to be a phenomenon linked to large cities in the central and northern regions. Mr. Ciuffini (OSM) explained the uneven distribution of carsharing adoption rates in Italy addressing three factors. First, lower incomes in the south make it less attractive for carsharing companies to operate there. Second, the spatial conformation of a region, especially in large cities, plays a significant role in carsharing success – Palermo and Cagliari are exceptions. Last, cultural factors contribute to the

¹³³ It's called the Cuba effect, when the middle classes have no money to buy technology that costs a lot of money and there is no replacement of the car fleet.

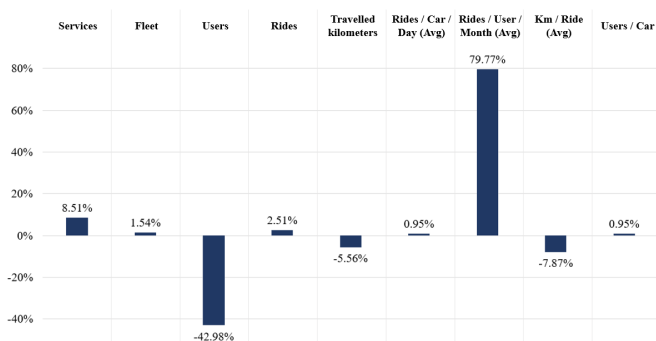
¹³⁴ European Environment Agency (2016)

¹³⁵ Osservatorio Nazionale Sharing Mobility (2022)

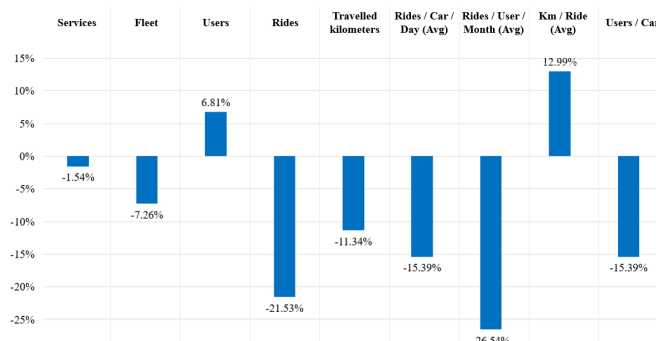
unevenness, with less consideration for carsharing in the south and a greater reliance on private vehicles due to poor local public transportation (LPT).

By analyzing the Compounded Annual Growth Rate (CAGR) from 2018 to 2021 for both carsharing models it is possible to shed light on the factors contributing to the sector's stagnation.

Station-based carsharing figures CAGR (2018-2021)



Free-floating carsharing figures CAGR (2018-2021)



Source: Personal elaborations from OSM data

Station-based carsharing models in Italy have seen a sharp annual decline of almost 43% in user numbers from 2018 to 2021. However, the users who have stayed have significantly increased their monthly trips by nearly 80% each year. This resilience during the Covid-19 pandemic demonstrates the ongoing demand for station-based carsharing, while other figures have remained relatively stable.

The scenario for free-floating services resembles a “perfect storm”, as defined by Mr. Ciuffini (OSM). Free-floating carsharing has been struggling to recover its pre-pandemic levels in terms of fleet size (-7.26%), rentals (-21.53%), traveled kilometers (-11.34%), cars’ turnover rate (-15.39%), and trips per user per month (-26.54%). However, a positive 13% increase in kilometers traveled per trip emerges from a less-than-proportional decrease in travelled kilometers to number of rentals, being an element of resilience and an opening of a new market segment demanding for longer rentals.

In Italy, the establishment and promotion of shared mobility services require the active involvement of local administrations, that play a crucial role in shaping the general regulatory framework and creating favorable conditions for the establishment and development of all shared mobility services, carsharing included¹³⁶. Municipalities’ objectives for urban mobility are frequently included in local planning tools such as the Sustainable Urban Mobility Plan (SUMP)¹³⁷. In addition, local administrations are also responsible for establishing the regulatory framework that carsharing operators must adhere to by means of municipal deliberations: minimum requirements for fleet composition and service standards, concessions and per-car fees are imposed by administrators to carsharing operators. Mr. Volpe, coordinator of the “*Agenzia Roma Servizi per la Mobilità*” provided insights on how the local carsharing market of Rome is managed by the agency. The agency works with Roma Capitale to establish operating parameters to reduce private vehicle

¹³⁶ Fondazione per lo sviluppo sostenibile et al. (2020)

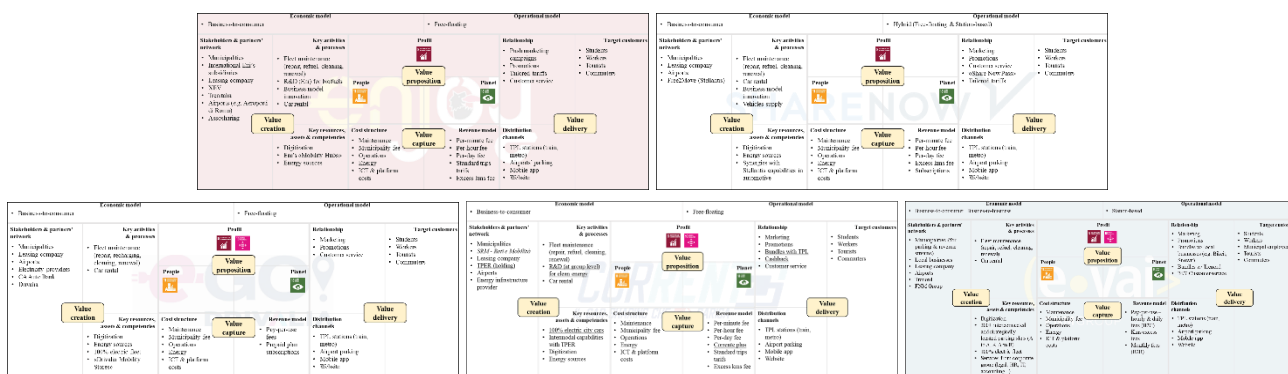
¹³⁷ Ibid

use. They monitor operators' compliance and implement penalties if necessary. The municipality has introduced per-car fees, with zero fees for electric vehicles and fees linked to the operating area for traditional cars to encourage expansion of services beyond the city center.

4. EVIDENCE FROM MULTIPLE CASES

This chapter presents the results obtained from the semi-structured interviews conducted with selected Italian carsharing operators and OSM. The first question addressed to operators focuses on their potential contribution to the SDGs, while the second and third questions explore value dynamics: enabling factors that foster value creation and delivery and challenges afflicting value capture. A Business Model Canvas¹³⁸ is presented for every carsharing operator in the first sample.

Italian carsharing operators' Business Model Canvas



Source: Personal elaborations

Enjoy was established in 2013 as a startup within an energy company – Eni. It now operates a free-floating model in five cities – Rome, Milan, Florence, Bologna, Turin. Massimo Rovatti, Head of Smart Mobility at Eni and Enjoy's coordinator, was interviewed.

Share Now emerged in 2019 from the merger of Car2Go and DriveNow, later acquired by Free2move (Stellantis) in 2022, operating a hybrid model (free-floating and station-based) in 8 European countries and 16 cities – in Italy Rome, Milan and Turin. Luigi Licchelli, Head of Business Development and Public Affairs at Share Now and carsharing coordinator at Assosharing, was the respondent.

E-Go! Drivalia replaced LeasysGo! as FCA Bank's carsharing model, rebranding and getting acquired by Crèdit Agricole Auto Bank in April 2023. Drivalia's free-floating carsharing is 100% electric, operating in the cities of Turin, Milan and Rome. A Carsharing Manager was interviewed.

TPER Group, “*Trasporto Passeggeri Emilia Romagna S.p.A.*”, introduced in 2018 Corrente, their free-floating carsharing service, to provide a 100% electric fleet complementary to LPT in Emilia-Romagna. The interview took place with Luca Astolfi, responsible for carsharing operations and contract management, and Paola Matino, mobility manager of the TPER group.

¹³⁸ Osterwalder, A., Pigneur, Y. (2010)

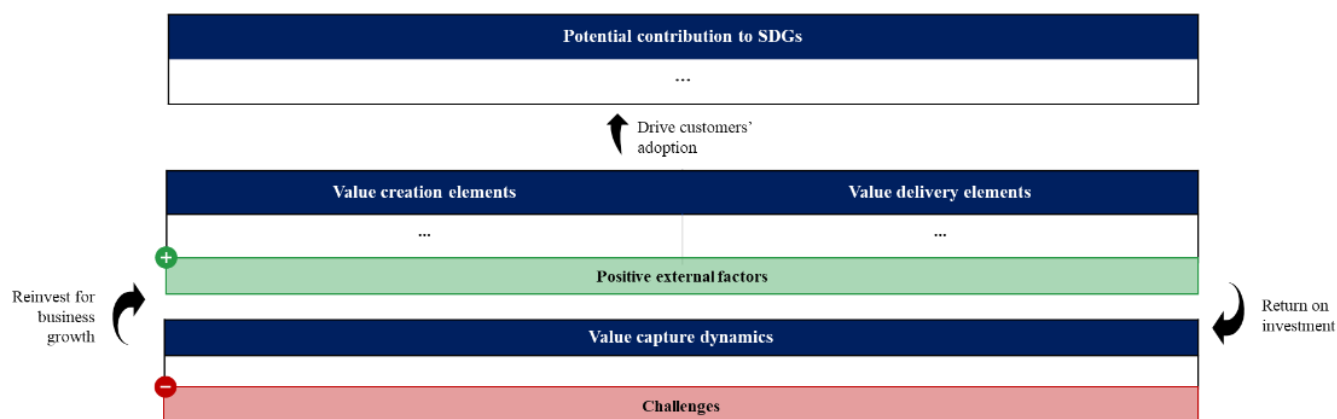
E-Vai is the 100% electric station-based carsharing service of FNM group, “*Gruppo Ferrovie Nord Milano S.p.A*”. It targets areas with lower population density, boasting a network of over 300 car pick-up/drop-off locations spanning across more than 110 municipalities in Lombardy. The interview featured Matteo Brambilla, Head of Marketing, and Francesco Pedol, Head of New Business Development.

Evidence emerged for each case was systematized in the last chapter in response to research questions.

5. KEY FINDINGS AND ANSWERS TO RESEARCH QUESTIONS

This chapter presents key findings aimed at bridging the research gaps identified in the literature review and answering the three main sub questions related to (1) the potential contribution of Italian carsharing operators to the SDGs in promoting a more sustainable urban mobility; (2) the key business model elements and external factors that support Italian carsharing operators in creating and delivering value; (3) the challenges that currently hinder Italian carsharing operators’ value capture dynamics. Interview data have been analyzed through thematic analysis method to identify patterns across individual cases. To organize key findings and build interconnections across the three research areas, the author has developed a framework connecting business model’s value dynamics to potential contributions towards the SDGs, which will be progressively filled as the analysis progresses:

Findings framework: value dynamics and potential contribution to SDGs



Source: Personal elaboration

In a nutshell, the framework's logic can be summarized as follows: the presence of value creation and delivery elements, combined with positive external factors, plays a pivotal role in facilitating consumers' adoption of carsharing. This, in turn, enables operators to pursue specific targets aligned with the SDGs while generating economic returns that can be reinvested to foster business growth. However, this process is non-linear, as the research has revealed various challenges that impede operators from fully capitalizing on the generated value. Consequently, this leads to low profitability and limited opportunities for reinvestment. The analyzed data were used to answer the research questions.

SQ1: *What Sustainable Development Goals do Italian carsharing operators potentially contribute to?*

The author's research indicates that carsharing has the potential to make significant contributions to four SDGs: Goals 8, 10, 11, and 13, related to economic growth, equal opportunity, sustainable cities and communities and climate action. These SDGs encompass six specific targets, with the magnitude of operators' contributions varying based on their operating models and specific business characteristics.

The research first identified three SDG targets – 8.4, 11.2, 13.1 – to which all operators, independently from their business model configuration or context-specific characteristics, potentially contribute. Their achievement is closely tied to the characteristics of the SPSS business model on which carsharing is grounded, the car ownership reduction effect through maximization of output (transportation) and minimization of inputs (cars). While a direct causal relationship between carsharing and reduced motorization rates is yet to be established, interviews suggest that carsharing can influence users' purchasing behavior and travel habits, leading to a shift away from private car reliance towards sustainable mobility options. For carsharing to have a meaningful impact, it must be preceded by a behavioral change induced by operators who create and deliver value to users. Car ownership reduction depends on four pre-conditions: (1) ubiquitous presence of carsharing fleets and immediate car availability in the area; (2) efficiency of alternative sustainable mobility solutions (i.e. LPT, taxis, micromobility...), relieving concerns and enabling a shift in consumers' mindset towards sharing instead of relying on private mobility; (3) integration with alternative mobility solutions, creating a sustainable mobility “ecosystem”; (4) economic convenience in using carsharing for those users who make moderate use of the car.

(1) The Italian carsharing fleet is still too limited, that is why operators are not direct competitors but rather partners in expanding vehicle availability, essential to achieve the first pre-condition. (2) There is lack of public policies enhancing the effectiveness of public transportation, which are necessary for establishing a strong alternative and addressing the second pre-condition. (3) The third precondition finds real match only in those cases where carsharing was initiated within corporate groups involved in transportation, where services integrate seamlessly with LPT. In addition, carsharing seems to be wedging itself into a particular niche market, that of longer-term rentals, leaving shorter-term rentals to micromobility and integrating as a sustainable "last mile" mobility solution. (4) based on the findings of a cost-effectiveness analysis of carsharing by ICS¹³⁹, it becomes apparent that carsharing operators have yet to significantly reduce mobility costs for users. The last precondition has not occurred yet.

Carsharing operators have the potential to align with **SDG target 11.2**, which strives to ensure access to a sustainable transport system for all, but for this potential to be realized car ownership reduction is key and the aforementioned preconditions need to be met, which is currently not the case.

Carsharing operators aim to align with **SDG target 8.4** for increased global efficiency in consumption, relying again on the car ownership reduction effect thereby subject to the preconditions above. Most free-

¹³⁹ ICS et al. (2019)

floating models offer flexible rental options, Share Now is keen on its subscription model, collaboration with holdings and bundles with public transportation are emphasized by Corrente and E-Vai models. However, as demonstrated by ICS, economic barriers hinder carsharing's core value in maximizing asset utilization and consumption efficiency. Thus, their actual contribution remains prospective.

Interviewees frequently highlighted the benefits of replacing older, less environmentally friendly vehicles with newer models with lower emissions. This argument holds even greater weight when carsharing operators incorporate electric cars into their fleets, as these vehicles produce zero exhaust emissions. This argument, though still in the realm of potential contribution, can be reasonably correlated with the **SDG target 13.1**, which focuses on fortifying resilience and adaptability to climate-related risks and environmental catastrophes.

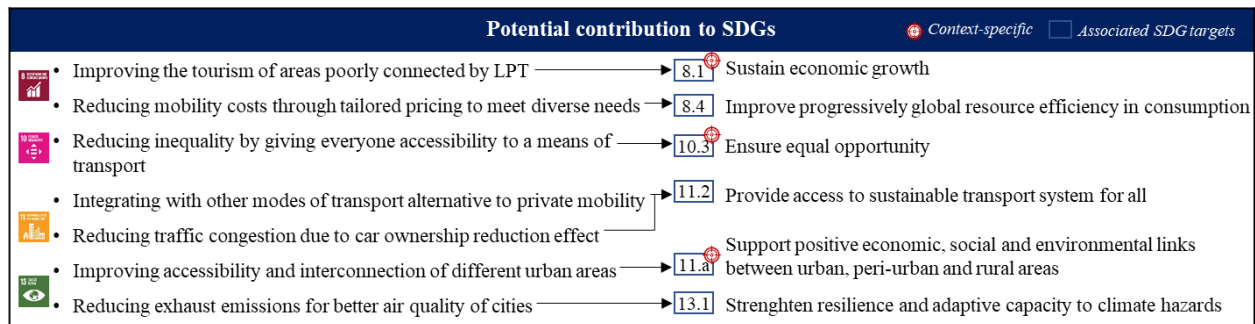
Then three specific SDG targets - 8.1, 10.3, 11.a - were subsequently uncovered, each requiring the involvement of operators possessing context-specific characteristics.

From the interviews with Corrente and E-Vai, it became evident that carsharing can enhance tourism in areas with limited access to LPT. Both services, being part of corporate transportation groups, strive to provide users with a seamless mobility experience. E-Vai, due to its station-based business model, ensures easy accessibility for public transport users as parking lots are strategically located outside the stations. Corrente enables its fleet to circulate without limits (also locking and unlocking cars) in a large operating area encompassing multiple cities in Emilia Romagna, contributing to increasing the inflow of tourists to smaller cities. By facilitating tourism to smaller, less connected locations with public transport, carsharing aligns with target the **SDG target 8.1**, which aims to support economic development.

Carsharing operators from the sample that currently offer electric vehicles increase fleet's electrification rate (27%) – versus 0.2% of private cars in Italy. By providing users with access to electric vehicles, these operators help reduce inequalities by offering individuals the opportunity to experience electric vehicles, which might otherwise be financially inaccessible or limited in availability. This aligns with **SDG target 10.3**, aiming to ensure equal opportunity.

Finally, carsharing operators from the sample that operate across extensive geographical areas, i.e. Corrente and E-Vai, have articulated a compelling argument concerning the improvement of interconnectivity and integration among diverse urban areas, where LPT does not arrive. E-Vai ensures easy accessibility for commuters with its extensive area and 300+ parking lots strategically located in Lombardy. Corrente's vehicles can circulate without limits (also locking and unlocking cars) in a large operating area encompassing multiple cities in Emilia Romagna. As a result, they contribute to the realization of **SDG target 11.a**, which aims to facilitate positive economic, social, and environmental ties between urban, peri-urban, and rural areas.

1st findings framework component: potential contribution to SDGs



Source: Personal elaboration

SQ2: What are the key business model elements and external factors that support Italian carsharing operators in creating and delivering value?

Carsharing operators build their business models around key elements to create and deliver value to their customers, trying to propel a shift of consumers' mindset from ownership to sharing.

In terms of value creation, operators can offer benefits to consumers – free blue stripe parking, access to limited traffic zones (LTZs) and dedicated parking – because they pay fees to municipalities. Moreover, partnerships with other companies, particularly airport operators or transportation companies operating extensive railway networks, secure strategically located and reserved parking lots that function as contact points with customers, allowing operators to increase territorial coverage and position as a convenient "last mile" solution. Active participation in industry associations – i.e. Assosharing –, also plays a significant role in obtaining additional advantages and lobbying – i.e. reduction of VAT taxation from 22 to 10% and the elimination of fees imposed by municipalities to carsharing operators. Among key activities, business model innovation is key to create unique value for customers: (a) Enjoy stands out by incorporating battery swap technology into its fleets, fostering innovative and efficient recharging processes; (b) Share Now emphasizes international integration, offering a seamless experience across different geographical locations; (c) e-Go Drivalia has developed proprietary hubs for vehicle recharging, enhancing convenience for users; (d) Corrente sets itself apart by implementing distinct operating area rules, enabling users to travel between cities; (e) E-Vai differentiates itself by adopting a station-based configuration, facilitating interconnectivity between large and small municipalities throughout Lombardy. Vehicle supply through long-term rental agreements enables operators periodically renew cars to maintain a modern and environmentally friendly fleet and electrify fleets to promote reduced emissions.

Moreover, operators in the sample are all associated to corporate groups: Enjoy with Eni (Energy sector), Share Now with Stellantis (Automotive sector), Drivalia with CA Auto Bank (Automotive sector), Corrente with TPER (Transportation sector), and E-Vai with FNM Group (Transportation sector). These affiliations provide synergies that enable and differentiate them in the market: (a) Enjoy benefits from Eni's 6,000+ mobility hubs for recharging, refueling, battery swaps and vehicle cleaning; (b) Share Now and Drivalia acquire vehicles at favorable prices through their respective holding companies in the automotive sector;

(c) Carsharing services within transportation groups enjoy greater integration with LPT, expanding access beyond established mobility hubs, especially outside railway stations.

In terms of value delivery, operators like Corrente and E-Vai integrate with LPT, offering bundled packages to public transport subscribers. This addresses the "last mile" challenge and aligns with SDG target 11.2. Moreover, operators provide diverse rental options, including minute-based fees, daily rates, and monthly packages to meet diverse needs – pricing convenience still remains uncertain. However, operators are shifting towards longer-term packages, such as Corrente's "Corrente Plus" offering, which provides customers with extended access to a vehicle from a week to a month. Strategies like cashback models – Corrente – and reward programs – Share Now –, foster customer loyalty. Effective marketing communication, like Enjoy's display of economic convenience on cars, is key for promoting carsharing.

Finally, carsharing operators benefit from three main external factors: (1) the emergence of a new market segment demanding for longer rentals for free-floating models – opportunity for operators to find the consumer niche to target and fit into the ecosystem of sustainable mobility solutions; (2) the development of MaaS4Italy, an Italian government initiative that seeks to implement Mobility-as-a-Service (MaaS) aiming for integration of multiple public and private transportation services – public transit, carsharing, bike sharing and taxis, driving the harmonious integration of sustainable mobility solutions; (3) innovations in the adjacent automotive and energy markets, enhancing process efficiency and fostering an increased effectiveness in creating and delivering value – Enjoy's partnership with XEV, pioneering battery exchange technology for a circular economy, development of teleguided technology, induction charging and biofuels.

2nd findings framework component: business model elements and external factors for value creation and delivery

Value creation elements		Value delivery elements
Stakeholders & partners' network <ul style="list-style-type: none"> • Agreements with companies for reserved parking lots • Agreements with municipalities to obtain licenses for parking, dedicated parking lots and access to LTZs • Trade association to bring forward petitions to government for improved regulatory environment 	Key activities & processes <ul style="list-style-type: none"> • Business model innovation • Supply of cars under long-term rental agreements making procurement more flexible • Periodic renewal and maintenance of fleets to offer newest and most environmentally friendly cars 	Customer relationship <ul style="list-style-type: none"> • Bundles and promotions linked to the use of local public transport • Loyalty rewarding programs • Marketing communication to guide consumers towards embracing a sharing mindset • Wide-ranging rental options to meet different consumer needs
	Key resources, assets, competencies <ul style="list-style-type: none"> • Synergies with corporate group's competencies • Electric and hybrid cars in fleets 	Distribution channels <ul style="list-style-type: none"> • Strategic contact points with dedicated parking lots (airports, train stations...)
Emergence of new market opportunities <ul style="list-style-type: none"> • Development of MaaS4Italy for better integration with other transport modes alternative to private mobility • Increased customers' demand for extended rental periods • Development of new enabling technologies in adjacent industries (automotive and energy) 		

Source: personal elaboration

SQ3: *What are the challenges currently hindering the value capture dynamics of Italian carsharing operators?*

The research has identified four groups of challenges that either increase operating costs or decrease potential revenue generation.

The first set of challenges pertains to the difficulties in managing the day-to-day operations of carsharing businesses. Carsharing operators face logistical challenges in fleet management, with free-

floating operators experiencing the dispersion of vehicles outward from the city center, thus leading to fewer available vehicles in high-demand areas and requiring significant resources for relocation. Electric carsharing operators also struggle with time-consuming recharging processes – needs to be done slowly to preserve battery lifespan – and technical downtime during maintenance, leading to increased operating costs. Vandalism and abuse of vehicles pose additional challenges, resulting in additional repair costs and deductibles. Customizing operations for each city adds complexity and reduces economies of scale. Furthermore, carsharing fleet's limited capacity hinders and limits operations, as it fails to serve a substantial percentage of potential users. The disparity between the number of carsharing vehicles (6.643 in 2021) and the significantly larger private car fleet (38.5 million) calls for urgent investment and policy intervention. The constraint of fleet size translates into a decrease in revenue potential, as a significant pool of potential customers remains untapped.

The second group of challenges involve consumer-related issues, which act as barriers to carsharing adoption and hinder the capture of potential revenues from untapped demand. A notable challenge that electric carsharing operators encounter is consumers' range anxiety, particularly when it comes to using electric vehicles for longer trips. This concern becomes even more significant as the entire carsharing sector is shifting towards a market segment demanding longer rental periods. Additionally, the sentiment analysis of mobile carsharing app reviews conducted by the author revealed widespread dissatisfaction with carsharing applications, primarily due to issues such as bugs, poor design affecting the user experience, inadequate customer support, slow performance and difficulties in app usage. Notably, the analysis revealed a high level of dissatisfaction specifically related to pricing, a significant barrier to adoption. This finding is in line with the earlier ICS study, which emphasizes the persistent issue of affordability in the carsharing industry, which serves as the fourth precondition for carsharing operators to make a meaningful contribution for a more sustainable urban mobility. Operators need to leverage available resources to enhance adoption or explore avenues to further lower prices. The current circumstances do not allow for immediate adjustments, leading operators to seek support from stakeholders like Assosharing to mitigate the financial impact of government and municipal policies and stabilize their financial situation, which is currently unstable for most operators.

The third set of challenges includes limited charging station coverage, that restricts the expansion of electric fleets to avoid further operations' management difficulties and causes loss of potential revenues from untapped demand, and contingent factors that contribute to increase costs, such as crises in the automotive and energy sectors related to Covid-19 pandemic and the Ukrainian war, by increasing delivery time for vehicles' supply and disrupting the whole supply chain. Also, interviews revealed that the increasing popularity of micromobility options, such as scooters and bicycles, has added to the challenges faced especially by free-floating models. It may have eroded carsharing demand for short-distance rentals, which has always been the core market segment for free-floating models, thereby decreasing potential

Source: Personal elaboration

Therefore, by establishing connections between framework components, the primary objective of this research can be successfully accomplished by providing a conclusive answer to the main research question: *Can B2C carsharing operators effectively support the sustainable development of urban mobility in Italy?* Yes, at present, carsharing operators definitely hold the potential to support the sustainable development of urban mobility, but their contribution is limited as the sector they operate in is going through a deep crisis, which results from barriers and challenges that do not allow them to have adequate economic return for reinvesting profits, improving service quality, fostering business growth and driving customers' adoption. The financial sustainability of carsharing remains a significant issue for Italian operators, limiting their ability to invest in business growth, fleet expansion and service enhancements. Operators are trying to solve challenges related to business and operations' management and consumers by leveraging business model innovation. In the near future, carsharing businesses are expected to pursue diversification strategies to match greater demand across multiple segments – expanding the range of vehicle types beyond cars – and introduce new pricing formulas – e.g. new subscription models – to enhance economic convenience, thus increasing market share and business profitability. However, policy intervention addressing infrastructural and administrative constraints is crucial to ensure that these models effectively contribute to the sustainable development of urban mobility. Indeed, to unleash its full potential, carsharing must fit into a sustainable mobility "ecosystem", finding its identity in a harmonized integration with all the alternative transport modes to private mobility. First, government and local administrations must stimulate demand for sustainable mobility by improving the effectiveness and efficiency of public transportation and fostering the integration of these sustainable mobility solutions to enable a shift in people's mindset away from private mobility. Second, it is crucial to establish the appropriate conditions that enable carsharing companies to expand their market share and effectively convert their potential contribution into actual impact – creating a supportive regulatory framework, developing infrastructure and public policies that incentivize the sustainable mobility “ecosystem” over private mobility. Ultimately, it becomes essential to implement measures that discourage private mobility to address the harm of cities' congestion and pollution.

Implications

This research aims to provide carsharing operators with “actionable” insights to help them understand which areas to focus on to generate greater profitability and enable business growth, highlighting the most important challenges that hinder adequate economic return from their activities. In addition, the research reveals the crucial role of incentive policies by public authorities in promoting carsharing as an alternative solution to private mobility. By presenting a clear and comprehensive overview of the current state of carsharing operators in Italy, this research aims to contribute to the decision-making process of public authorities in establishing favorable conditions and regulatory frameworks that support the growth and realization of carsharing's potential contribution to sustainable development of urban mobility.