SEAMLESS SHARED URBAN MOBILITY

Best Practice Analysis

Project deliverable D5.3

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Project Executive Summary

The objective of the SUM project is to transform current mobility networks towards innovative and novel shared mobility systems (NSM) integrated with public transport (PT) in more than 15 European Cities by 2026, reaching 30 by 2030. Intermodality, interconnectivity, sustainability, safety, and resilience are at the core of this innovation. The outcomes of the project offer affordable and reliable solutions considering the needs of all stakeholders such as end users, private companies, public urban authorities.

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Deliverable executive summary

The objective of Deliverable D5.3 is to examine and establish best practices for creating seamless, integrated, and viable business operations. This involves a comprehensive analysis using the Business Model Canvas as a foundational framework to outline the ecosystem's structure, ensuring each component contributes effectively to the overarching goals of seamless and integrated shared urban mobility. The methodology employed in WP5.3 integrates theoretical frameworks with empirical research, focusing on the interdependencies and collaborative efforts required to foster a sustainable urban mobility environment. By utilizing the Business Model Canvas, the project identifies and evaluates how different segments - such as customer relationships, key activities, and revenue streams - interact within this ecosystem. The deliverable harnesses these insights to craft a blueprint for seamless shared mobility solutions that are economically feasible while adhering to viability principles. Through engaging with various stakeholders (expert survey) and employing best practices, this study will aim to develop an evaluation framework focused on business structure that not only meet current new shared urban mobility needs but also anticipate challenges and ensure sustainability of the seamless ecosystem.

1.1 Key words

Business model, ecosystem, canvas, seamless, best practice, shared mobility, value, viability, expert survey

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List of abbreviations and acronyms

Acronym	Meaning
API	Application programming interface
BMC	Business Model Canvas
B2B	Business-to-business
B2C	Business-to-Consumer
IT	Information technology
ITS	Intelligent Transportation Systems
KPI	Key Performance Indicator
MaaS	Mobility as a Service
NSM	New Shared Mobility
OEM	Original Equipment Manufacturer
P2P	Peer-to-Peer
PT	Public Transport
PTA	Public Transport Association
PTO	Public Transport Operator
SUM	Seamless Shared Urban Mobility
SUM	Seamless Shared Urban Mobility
TNC	Transportation Network Companies
WP	Work Package

2 Introduction

The growth of the urban population presents significant urban mobility challenges for sustainable city development. Addressing air pollution, energy consumption, congestion, and accessibility becomes crucial, especially to counteract the rise of private vehicle use and achieve the decarbonization goals in Europe by 2030 and 2050. The COVID-19 and recent energy crises underscore the urgent need for a shift towards an energy-efficient public and shared mobility ecosystem. However, actualizing these shifts and bringing them into market reality poses complex challenges in practice.

The European project SUM (Seamless Shared Urban Mobility) focuses on enhancing shared mobility competitiveness and increasing its modal share by developing technological, co-creation, and policy tools and solutions to overcome barriers for car-focused for car-focused individuals and households in urban areas. Over the course of the project, SUM will implement a series of new business and measures in 9 Living Labs across Europe and abroad i.e., Munich, Geneva, Jerusalem, Athens, Rotterdam, Krakow, Frederikstad, Larnaca, and Coimbra.

2.1 A Viable Business Operation

Achieving a viable business in an integrated and seamless urban mobility market requires cooperation and collaboration across various organizational settings (Melkonyan et al., 2020). To ensure success, this involves engaging stakeholders and integrating various mobility and technology options within the **seamless business ecosystem**. Furthermore, to adapt to evolving market demands, it is essential for the business to embrace trends such as digitization, electrification, automation, and sustainability objectives. As a result, one of the fundamental objectives of Project SUM is the examination of business structures (leveraging on the experience to be gained from the living labs) which can be transformed into a **viable business operation**.

> **The critical process of examination:** The process involves exploring how the seamless business ecosystem - comprising multiple stakeholders - creates, captures, and delivers value. Here in project SUM, value refers to the economic, social, and environmental benefits that the ecosystem provides to its users, stakeholders, and the broader community. Moreover, it's essential to determine what components of the business ecosystem should or could work together and contribute to the viability of such alternative business structure.

Transitioning from traditional models, researchers and practitioners believe that stakeholders and their underlying business models should not only be seen as independent actors in a single industry but as one part of a business ecosystem (Karlsson et al., 2020; König et al., 2017). However, practical research often overlooks the ecosystem perspective. Normally, in a single industry or company point of view, business models identify organization's added value (i.e. Value proposition), attracted customers to pay for the value (i.e. Value creation and delivery), and managed profit from this relationship (i.e. Value capture) (Budler et al., 2021; Teece and Linden, 2017; Teece, 2010; Osterwalder and Pigneur, 2013; Osterwalder et al., 2005).

The business ecosystem on the other hand is broader and emphasizes the interdependence of various stakeholders. This approach considers how these single industry or company level business models cooperatively can generate and capture values involving multiple stakeholders while emphasizing the efficiency of the integrated offer under sustainability objectives (Biancuzzi et al., 2024; Snihur and Bocken, 2022; Vorbohle and Kundisch, 2024). In this context, interdependency of stakeholders means that their actions and successes affect one another. Consequently, this perspective demands collaborative efforts across various mobility service layers, including digital infrastructure, fleets, service providers, operators, as well as the users (both customers and society in general).

Now, a competitive and complex mobility market is characterized by a complex interaction between public sector authorities, private companies, technology providers, and users (i.e. both direct and indirect customers). It is important for such interdependent business structure to be viable where all stakeholders can derive value from it, fostering their engagement and commitment while ensuring that the implemented business operation will live on as a real service (i.e. being sustainable).

> **Our strategic approach:** As we look towards the future, business models must evolve to integrate innovative and complex partnerships across diverse private and public sector entities, fostering engagement and commitment at every level. These models should facilitate new types of collaborative arrangements, designed to handle intricate interactions and interdependencies that have rarely been explored by experts or mobility providers. Such a seamless approach transcends the traditional framework of organizational collaboration. Instead, it offers a strategic perspective and analytical method that focuses on delivering a unified value proposition to customers; a result that cannot be achieved by any single organization on its own, requiring a deep commitment and coordinated effort among all partners (Adner, 2017; Karlsson et al., 2020; Snihur and Bocken, 2022).

To fully leverage this strategic approach, we shift our perspective to treat seamless shared urban mobility as a single, cohesive business operation within the living lab's environment. We treat the seamless approach as an ecosystemic business structure, that focuses on both the way multiple organizations create and capture value, and the way the ecosystem creates and captures value to deliver a joint value proposition to both direct and indirect customers. By definition ecosystemic business model is a system of interdependent activities undertaken by the set of actors interacting in an ecosystem that allow the creation, delivery and monetization of value in a collective manner (Brea, 2023).

> **An ecosystemic business structure:** Guided by these insights, the ecosystemic business structure perspective therefore helps us to explore how to effectively implement the innovation in hand (i.e. seamless business structure), how to create economically viable and sustainable business scenarios for those stakeholders involved, and how to measure the successful integration and adoption of these innovations in the market. This leads us to understand the **structure**, the **content** and the **governance** mechanism of the ecosystemic business structure.

Figure 1 illustrates the framework that will be used to evaluate the content, structure, and governance mechanisms of business operations in project SUM, Work Package (WP) 5.3. According to this framework, WP5.3 will conduct its evaluation throughout the project cycle.

1. The understanding of a business model can vary based on the framework or perspective we use to analyse it. The purpose of a business model is to create, capture, and deliver value to customers. The traditional structure is predominantly **economic-oriented**.
2. One tool that helps to map out what a business does and how it operates is the **Business Model Canvas (BMC)**. This framework breaks down the activities of a business into three main dimensions: Value Proposition, Value Creation and Delivery, and Value Capture (Bocken et al., 2014; Osterwalder et al., 2005; Osterwalder and Pigneur, 2013; Thornton, 2024).
3. Within these three dimensions, the BMC further organizes a business operation into **9 building blocks**. The **value proposition dimension** includes three blocks: Products and Services, Customer Segments, and Customer Relationships, focusing on a range of solutions for customers and the methods by which they are delivered. The **value creation and delivery dimension** comprise four blocks: Key Activities, Key Resources, Channels, and Key Partners, detailing the methods and means by which organization generate value throughout the value chain. The **value capture dimension** contains two blocks: Cost Structure and Revenue Streams, outlining the financial aspects of the business (König et al., 2017; Osterwalder and Pigneur, 2013).

- To transition from a traditional business model (i.e. economic-oriented), which primarily focuses on economic goals, to a more complex, multi-actor business ecosystem, a thorough understanding of the existing economic-oriented structure is essential. Subsequently, it is crucial to enhance this structure by integrating additional dimensions: a **sustainability-oriented** business model and a **control and governance** framework tailored to the ecosystem. These layers must be interconnected and adhere to well-defined **viability principles** as well, ensuring they collectively support and facilitate seamless, integrated strategies for new shared urban mobility solutions.

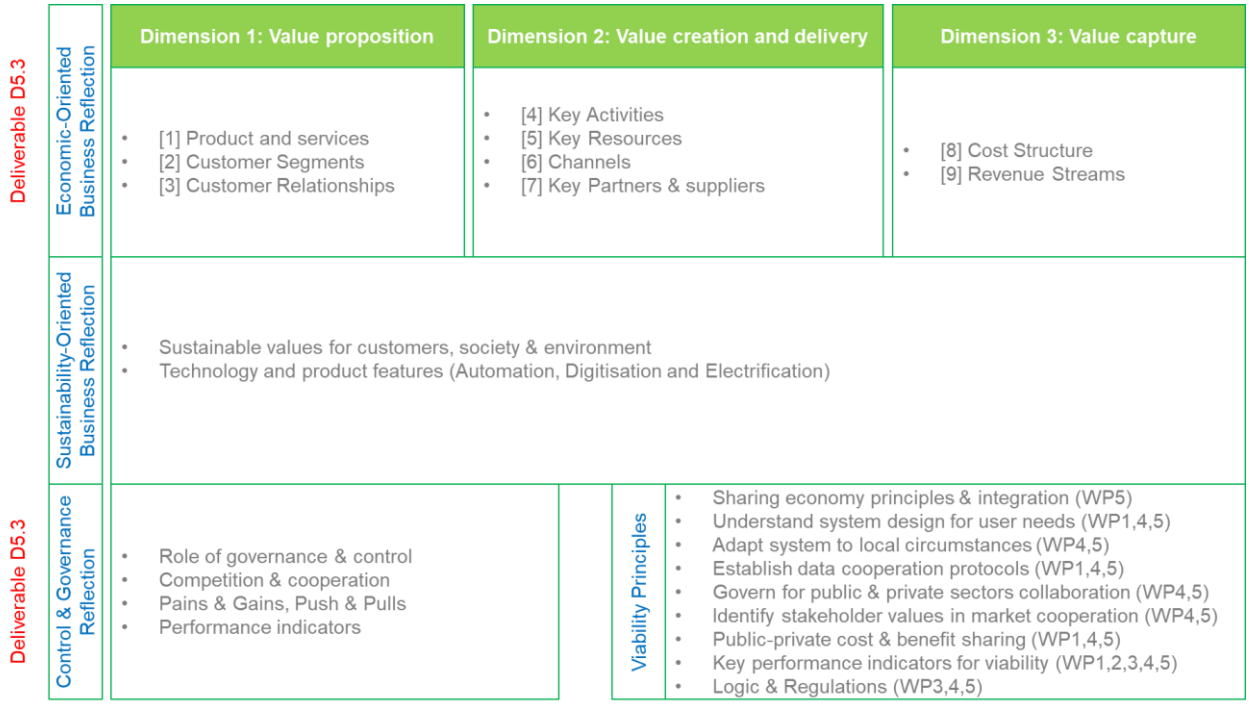

Figure 1 - Business ecosystem evaluation framework

2.2 The objective of deliverable D5.3

As mentioned, the ecosystemic business evaluation framework should facilitate new types of collaborative arrangements, governance and control mechanism designed to handle intricate interactions and interdependencies. The goal of this study is to understand the structure, the content and the governance mechanism of the ecosystem that leads us to a successful adoption of seamless shared urban mobility business operation. The content involves the activities the ecosystem performs to add value, the structure concerns the design and management of these activities for efficiency, and governance defines the responsibilities of each actor to ensure cooperation.

The **structure** is described using three key dimensions: value proposition, value creation and delivery, and value capture. These are further detailed in **9 building blocks of the BMC** (See **Figure 1**). The objective of Deliverable D5.3 is to identify the **content** for each block that effectively helps us to understand the interdependencies and the way the **control** and **governance** system should work to achieve a viable business ecosystem for seamless shared urban mobility integrated with PT system.

> **Summary of activity:** Understanding the structure, content and governance mechanism of a business operation includes strategies for revenue generation, offering value to customers, managing relationships with suppliers, and having a clear financial plan. It also involves identifying

relevant partners, deciding on distribution channels, identifying key resources and processes, positioning the business competitively, and engaging with customers. Additionally, principles of sustainability and long-term viability are also taken into account.

Following the defined ecosystemic business structure analysing framework, the primary scopes of this Deliverable D5.3 are:

1. To document the current state of business model structures and contents of existing best practices in integrated shared mobility and public transport services (i.e. Bike-sharing, Car-sharing, Motorcycle sharing, On-demand ride services, Ride-sharing, Scooter sharing and Mobility as a Service (MaaS)).
2. To deepen this investigation, conduct expert online survey with min. **150 relevant stakeholders**.
   - To assess governance and control mechanism
   - To assess main potential challenges for mobility providers in integrating new services
   - To assess the main potential barriers for user acceptance of offered solutions
   - To assess main potential business viability enablers
   - To assess key activities for achieving a viable business ecosystem
   - To realise stakeholders' involvement in implementing viable business operations
   - To assess cost factors that burden operators who participate in the new integrated solution
   - To identify performance indicators to measure the viability of new business operation

This documentation therefore lays a foundation for exploring the viability of living labs' business ecosystems throughout Project SUM in the next steps.

2.3 Structure of the deliverable and links with other work packages/deliverables

This report contributes to WP5 of the project SUM, titled **"Impact Assessment, Knowledge Utilization, and Policy Recommendations."** Specifically, it addresses Task 5.3, **"Designing Business Models to Leverage the Experience Gained in the Living Labs,"** which includes three main deliverables: (1) Deliverable D5.3 – Best Practice Analysis, (2) Deliverable D5.4 – First Version of Validated Business Models, and (3) Deliverable D5.5 – Final Validated Business Models and Transferability of Business Models. The Deliverable D5.3 begins by examining existing best practices in previous mobility initiatives from both scientific and industrial perspectives.

These deliverables are closely linked with several components of the project. They are associated with WP1, which focuses on defining the needs and key performance indicators (KPIs) for each Living Lab. They also tie into WP2, which incorporates the simulation results to complement the business models' viability assessments. Additionally, WP3 and WP4 are involved for incorporating local circumstances, validating hypotheses and fulfilling data requirements through the coordination of all Living Labs. Moreover, the transferability of these business models will be evaluated, particularly between the leader Living Labs and follower cities.

Section 3 of Deliverable D5.3 outlines the methodology used to establish a foundation for analysing the business operation viability within the SUM project. It includes a theoretical framework, methods for analysing best practices, and the structure of the expert survey. **Section 4** presents the results of this analysis, while **Section 5** discusses these findings in the context of the expert survey results. Finally, **Section 6** concludes with the implications of the findings and **Section 7** outlines the next steps.

3 Methodology

By treating business models as an ecosystem, we explore definitions, best practices, enablers, challenges, and barriers to help structure the foundation for SUM's business operation viability analysis. This analysis involves examining reported best practices in business operations through the lenses of content, structure, and governance mechanism supported by insights from expert survey. This chapter details the methodological approach.

- Theoretical framework
  - What are shared mobility services?
  - What is seamless integrated shared urban mobility?
  - What are the principles to assess a business operation viability?
- Structure of business operation: best practice analysis
  - We use an analysis approach in order to identify relevant examples of contents (from published best practices) within the building blocks of BMC.
- Content of business operation: best practice analysis
  - The analysing approach positions potential business operation components by defining business structure's features from the best practice. This enables the identification of main contents playing role in application of business models defined for each best practice.
- Expert Survey questionnaire contents which dive into control and governance aspects of the different shared mobility solutions

Figure 2 describes how the methodology will be implemented.

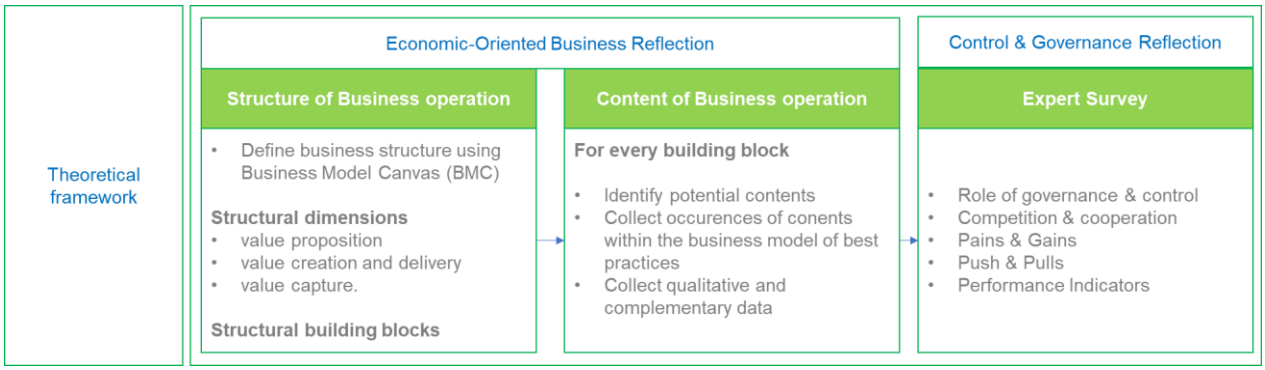

Figure 2 - From structure to contents and from economic oriented to ecosystemic reflection

3.1 Theoretical framework

To lay the groundwork for this research, we first define the basic concepts and terminologies; types of shared mobility services and definition of seamless integrated shared urban mobility. Finally, we outline principles identified for assessing a viable business operation.

Innovative mobility concepts such as shared mobility services have been progressively adopting practices from the sharing economy principles and are designed to tackle market failures in the transportation sector, which arise from several issues such as increased congestion, emissions, and environmental degradation, along with the lack of affordable, reliable, resilient, eco-friendly, safe, and interconnected mobility options. Meanwhile, recent advances in digital and intelligent technologies are expected to disrupt mobility ecosystem with a potential to boost their popularity.

3.1.1 What are shared mobility services?

Shared mobility or 'mobility in the sharing economy' entails the sharing of an asset that is not owned but accessed. It refers to the innovative use of shared vehicles, bicycles, motorbikes, or other modes of transportation that allows users temporary access whenever needed (CERRE, 2019). This concept encompasses two types of sharing: sequential sharing, where different users take turns using the same transport vehicle or equipment one after another, and concurrent sharing, which involves multiple non-household users sharing the same vehicle or equipment during the same journey (Susan Shaheen, 2019). The term therefore includes various forms of "vehicle sharing services" and "share a ride service". Vehicle sharing services include carsharing (e.g. Target oriented, Business-to-Consumer (B2C), Business-to-Business (B2B) corporate sharing, and Peer-to-Peer (P2P) personal vehicle sharing), and shared micromobility services (e.g. (e)bike-sharing, (e)scooter-sharing, motorcycle sharing, and kick scooter sharing). Share a ride services include ridesharing (single-trip carpooling and vanpooling), on-demand ride services (e.g. ride-hailing, ride-splitting,) and micro-transit demand responsive PT services) (Narayanan et al., 2020; Susan Shaheen, 2019).

Recently, shared mobility services have also exploded in popularity due to advances in technology and evolving sharing economic perspective toward sustainable transportation, that includes concepts like MaaS, integration of mobility hubs and innovations like vehicle automation and vehicle electrification. MaaS can be defined as a customizable travel management platform and a distribution model through one single interface that bundles together various modes of transport - public, intermediate, and private - allowing users to plan, book, and pay for their trip in one seamless process, with the aim of providing a sustainable alternative to private cars (Arias-Molinares and García-Palomares, 2020; Zhao et al., 2021). The detail analysis of different shared mobility services can be found in Deliverable D1.3 of WP1 titled "**A State-of-the-art Review on Shared Mobility: Strategic Innovation and Best Practices**".

3.1.2 How should Seamless Shared Urban Mobility Businesses Operate?

With the movement towards sustainable and smart cities, seamless integration of shared mobility services with public transportation under cooperative management mechanisms is seen as a solution to cope with many challenges. Organising services and coordinating activities of different partners within multimodal mobility management could assist cities in optimizing traffic management by more effectively utilizing the available capacity of various transport modes (Rodriguez and Mizaras, 2020). With that, addressing system-wide challenges requires a seamlessly integrated mobility system that coordinates different transportation modes and more effectively orchestrates the complex network of stakeholders in the mobility landscape. A significant knowledge gap exists in understanding integrated seamless shared urban mobility, whether it pertains to the mobility service provider as an industrial beneficiary or as a service provision concept through a cooperative ecosystemic mechanism.

Seamlessness refers to continuity and absence of interruptions and a direct synonym for seamlessness is *integration*. The dynamics of existing mobility challenges should be analysed through different perspectives including business viability, economic, financial, technological and technical, regulatory and legal, organizational, topological, user and social acceptance. Without a viable business model, this integrated service will ultimately discontinue, irrespective of whether it is operated by a private (i.e. mobility service provider as an industrial beneficiary) or a public entity (i.e. Public Transport Operators (PTOs)).

In Deliverable D5.3, the business operation of integrated seamless shared urban mobility is going to be assessed based on following two definitions:

1. **Integrated solution across all mobility service providers**

   This aspect defines seamlessness as an integration of systems designed to enhance the efficiency of moving people. It does this by ensuring interconnectivity of mobility options - between physical mobility assets like cars, bicycles, buses, scooters, trains and trams – and integrating digital technologies such as dynamic pricing schemes and data sharing agreements, while establishing governance structures, regulations, standards, and rules for their integrated operation. Hereby, seamless mobility describes a seamlessly coordinated chain of public, private and commercial mobility providers that respond to requests and make offers in real-time. (Becker et al., 2020).

2. **Integrated user interface**

   Seamless shared urban mobility also refers to the creation and management of an urban transport business ecosystem that offers efficient and integrated travel experiences across various modes of transportation within a city. This concept highlights the significance of integrating different transportation options (through digital platforms for trip planning, scheduling, booking, and ticketing), including different shared mobility and PT services, to facilitate smooth transitions for individuals moving between modes, origins, and destinations (Hoess et al., 2024).

3.1.3 What is a business model and a business model canvas?

There are multiple definitions of a business model in the literature:

- A business model describes how a company delivers value to its customer segments and the structure of the company and its partners in creating, marketing, and delivering this value. The goal is to generate sustainable and profitable revenue streams (Osterwalder et al., 2005).
- A business model defines the organization's competitive strategy by detailing the design and pricing of its products or services, production costs, and how it differentiates itself through its value proposition. Additionally, they describe how the firm integrates its value chain with those of others in a value network (Rasmussen, 2007).
- By definition, a business model defines the logic and includes data and evidence showing how a business creates and delivers value to its customers. It also describes the structure of the business's revenues, costs, and profits associated with delivering that value (Teece, 2010).
- A business model defines the rationale, supporting data, and evidence that justify a value proposition for the customer, along with a sustainable revenue and cost structure for the business providing that value. It describes the benefits provided to customers, the organizational structure required to deliver these benefits, and the method for the business to retain some of the value it creates (Kao et al., 2019; Massa et al., 2017).
- The concept of a business model enables the extrapolation from potential customer benefits and value chain advantages to the necessary configuration and implementation of other elements of the business model (Geissdoerfer et al., 2018).

The BMC is employed as an open business model specifically designed to capture innovative strategies that enhance an organization's performance. This model is utilized for better planning and identifying sources of value creation, linking these directly to the overall business strategy (Trimi and Berbegal-Mirabent, 2012). Recognized for its effectiveness in dissecting various business model elements, this Deliverable D5.3 has selected the BMC as the primary tool. It offers a comprehensive view of how an organisation creates, delivers, and retains value.

3.1.4 How should the viability of a business be assessed?

A business model outlines the process by which a company transforms its resources and capabilities into a value (Teece, 2010). This mechanism provides the necessary information about the implementation of model's conceptual and technological implications that is required as a basis to capture a value, examine technologies and features to be embedded, identify benefits to customers, investigate market segments, and confirm available revenue streams. Now to adopt an ecosystemic perspective and to exploit business models that can create and capture value from and with multiple stakeholders (Sá et al., 2022) it is necessary to consider multiple objectives (e.g. economic and environmental sustainability) and take into account trends that accelerate sharing economy principles including impacts of digitisation, electrification and automation concept, serving as a foundation to our business operation assessment. Accordingly, the following principles have been identified to assess the viability of business operation:

- Understand how the system is designed and operated to serve collective and individual needs of all the mobility users.
- Understand how the system is designed to be adaptable to the local circumstances, including technological infrastructure and geographical conditions.
- Understand how the system should implement protocols to cooperate and exchange data between multi-actors.
- Understand how the system should be governed to increase collaboration within and between the public and private sectors and to reduce institutional complexity to enable a viable business structure to operate across available modes and functionalities.
- Understand what values stakeholders can derive from the cooperative and collaborative market environment and how this action can be explored within competitive market environment.
- Understand what type of initiatives are required for both public and private entities that enable multiple private-sector actors to underwrite the cost of the business and share in the potential monetary benefits.
- Understand what performance indicators are necessary to measure the viability of business operation.
- Understand the components of business operation best practices and how they impact business viability.
- Understand the logic and stages of business performance analysis (Vasiliene-Vasiliauskiene et al., 2020)

3.2 Structure of business operation: best practice analysis

A business model creates, captures, and delivers value to customers, often explained using the BMC. The BMC identifies a business's structure through nine building blocks.

3.2.1.1 Business Model Canvas

We use the economic-oriented BMC as a baseline structure of our evaluation by incorporating different building blocks characterizing the business and its functioning (**Figure 3**).

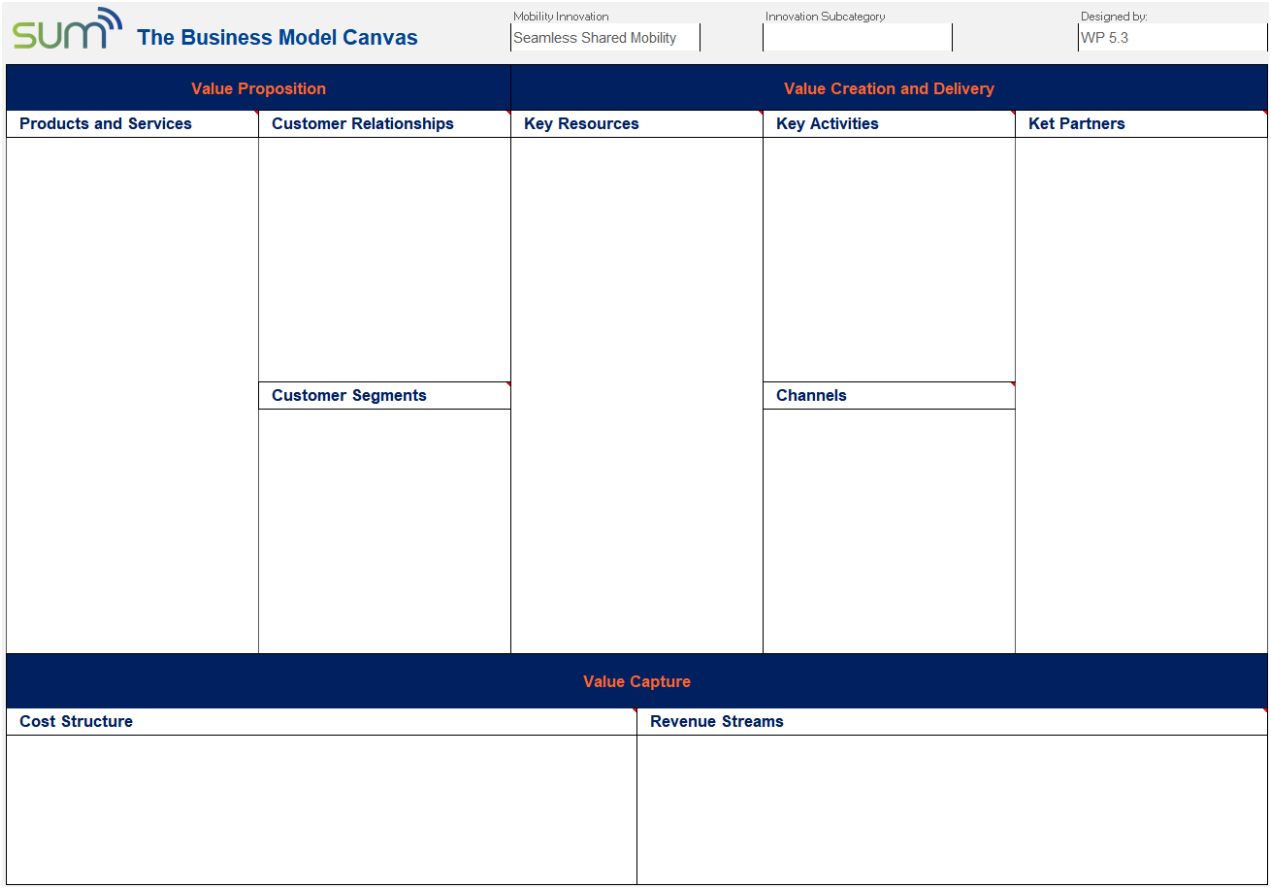

Figure 3 - Business model canvas structure

These elements fit into three main dimensions: (1) value proposition, (2) value creation and delivery, and (3) value capture. To illustrate the direct connection between these dimensions and the building blocks of the BMC in relation to shared mobility, **Figure 4** provides an example of the contents for a MaaS Solution.

3.2.2 Value proposition dimension

The value proposition dimension contains a range of solutions for customers and the methods by which they are delivered; answering to the question of what value is provided and to whom. By definition the value proposition therefore is defined as "the value the firm will offer to a customer relative to the competition" (Richardson, 2008).

- **[1] Product and Service**: Explains the benefits or value that the product and service deliver to customer segments by meeting their needs and generating economic returns. In a sustainable business, the value proposition would also include measurable ecological and/or social benefits alongside economic value (Boons and Lüdeke-Freund, 2013).
- **[2] Customer Segments:** An organization serves one or several Customer Segments.
- **[3] Customer Relationships**: established and maintained with each Customer Segment.

3.2.3 Value creation and delivery dimension

The value creation and delivery dimension outline the methods and means by which organization generate value throughout the value chain.

- **[4] Key Activities**: Represent the essential actions the business must perform to deliver on its value propositions.
- **[5] Key Resources**: Are the assets required to support and deliver the business activities and deliver value.
- **[6] Channels:** Value propositions are delivered to customers through communication, distribution, and sales channels.
- **[7] Key Partners:** Highlight the network of suppliers and partners that help the business optimize operations and reduce risks, which is crucial for structuring efficient business operations.

3.2.4 Value capture dimension

The value capture dimension specifies how value propositions are transformed into revenue streams, detailing how organization generate income to cover their costs and achieve profits for sustainable performance.

- **[8] Cost Structure:** Involves managing the costs associated with operating the business model.
- **[9] Revenue Streams:** Outline how the business captures value. It results from value propositions successfully offered to customers.

The Business Model Canvas

Mobility Innovation	Innovation Subcategory	Designed by:
Seamless Shared Mobility	Mobility as a Service	WP 5.3

Value Proposition
products and services that create value for a specific Customer Segment

Value Creation and Delivery
Value that is delivered to the new mobility services or technologies receivers

Products and Services

What bundles of products and services are we offering to each Customer Segment? Offer travelers a seamless, optimized, and customized traveling experience

* End to end seamless MaaS system that can support both B2C operations as well as B2B interaction with all Business and Governmental Stakeholders
* Increased coverage of transport modes due to multimodality and increased convenience
* Vehicle in MaaS Platform
* Options of renting vehicles
* Dedicated parking spaces
* 24/7 availability
* Optimized pricing and ticketing
* Optimized syncronized services (shared vs PT)
* Additional vehicle equipment
  - To improve the quality of city life
  - To reduce Traffic Congestion
  - To provide healthy transport
  - To provide accessible means of transport
* Crowdsource logistic data
* Service packages and subscriptions

Customer Relationships

What type of relationship does each of our Customer Segments expect us to establish and maintain with them?

* Service centers
* Automated Services, Communities, Co-creation
* Community platform for users and inhabitants
* 24/7 online and Telephone customer service
* Easy to use apps
* Convinient travel
* Inviting friend options
* Community ecosystem
* Special offers and rewards
* Help desks: Hotline and Mail Contact

Customer Segments

For whom are we creating value?

* End users: local users for business, leisure and commuting (including users with additional mobility needs), visitors
* Public transport passengers
* Shared mobility users
* First and last mile demands
* Support local authorities to deploy a successful seamless shared mobility solution scheme
* Support city traffic managers to operate a integrated multimodal management scheme

Key Resources

What Key Resources do our Value Propositions require?

* Vehicle fleet
* IT platform
* Mobile application
* Users
* Staff
* Traceable and data generation
* Data generated by riders
* Geo location systems

Key Activities

What Key Activities do our Value Propositions require?

* Specific Marketing approach
* Innovative fleet management
* Provision of vehicular data
* Customer oriented quality management
* Platform management
* Customer Service
* Marketing
* R and D activities
* Urban development
* Expanding the offer to other areas

Channels

Through which Channels do our Customer Segments want to be reached? How? How are our Channels integrated? most cost-efficient?

* Website
* Mobile application
* Customer service and customer surveys
* App store, Google Play
* Invitation codes
* Social media and blogs
* Emails
* Newsletter

Ket Partners

Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?

* Universities and Researchers
* Suppliers suppliers and manufacturers
* Municipalities
* Investors
* Local authorities
* MaaS Providers
* Organizers of collective transport
* Softw are Vendors
* Shared mobility providers
* Related Technology Providers (Charging, EV, AV, Sensors, etc)
* Business Partners including owners of parking lots, shopping malls, airports, and other places where bikes can park or be returned
* Vehicle service technicians

Value Capture
Revenues, costs, and expenses that go into the profit equation of the ecosystem

Cost Structure

What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?

* Platform maintenance and IT infrastructure
* Intelletual properties
* Fee to access the MaaS platform
* R & D Costs
* Infrastructure costs
* Salaries and Personel cost and Insurance
* International expansion, Marketing and management costs
* Customer service costs

Revenue Streams

For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?

* Subscription fee (monthly, hourly, kiometre)
* Usage fee
* Deposit
* Rule-braking charges and additional revenues

Figure 4 - Business model canvas structure for Mobility as a Service (Example)

3.3 Content of business operation: best practice analysis

The goal of this section is to determine which contents of business models (as listed in **Table 1**) are considered significant within best practices for each dimension and corresponding building blocks of a business structure. These elements are based on the works of Osterwalder et al., (2005), and have been utilized in studies by Krauss et al., (2022), König et al., (2016), Gilibert and Ribas, (2019), Lygnerud and Nilsson, (2021), and Polydoropoulou et al., (2020). To achieve this, we examine the frequency of each element in the literature related to real shared urban mobility use cases. The systematic review methodology is based on (Carreyre et al., 2022).

Table 1 Economic-oriented business model canvas building blocks

	Dimensions	Building Blocks and Contents
Economic-Oriented Business Reflection	Value Proposition	**Product and services**
		Service integration Personalisation Transport mode integration Type of sharing Service area Data analytics
		Customer Segments
		Customer service Customer integration Customer retention
		Customer Relationship
		Customer type Customer mobility style Customer modality style Trip purpose Travel frequency Spatial dimension Non-mobility customers
	Value creation and delivery	**Key Activities**
		Information technology (IT) platform development Application programming interface (API) development Service & content development Dynamic information provision Trip planning Booking Ticketing Routing Revenue sharing Fleet management Data analytics Software and hardware maintenance Quality control Payment transaction Real-time information provision Integration of other MaaS providers Customer support Marketing Data provision Lobbying
		Key Resources
		Technological platform User & driver apps API Computing hardware Routing and matching algorithms Journey planner Digital payment systems User data Further data (weather, etc.) Data analytic tools Knowledge management system Vehicles Transport infrastructure Refuelling/charging infrastructure Human resources Users Loans Private equity
		Customer Channels
		Communication channels, Distribution channels
		Key partners and suppliers
		IT infrastructure providers Data service providers GPS service providers Telecommunication providers Payment operators Public transport operators Private transport operators Transport Infrastructure providers OEMs Other MaaS providers Accommodation services Event & entertainment services Leisure services Research organisations Local government Regional government (Inter-) National government Road authorities Investors & Banks Venture capitalists Insurance companies
	Value capture	**Cost structure Value capture**
		Investment cost, Operational cost, Policy instruments
		Revenue stream Value capture
		Fares, Brockage fee, Service fee, Pricing mechanism

The main goals are:

- To identify business models characteristics and building blocks contents
- To understand why these characteristics may be of importance

In each source of literature (such as scientific articles, reports, and book chapters), when a specific sub-item (content) was mentioned in a use case, we recorded its occurrence to identify the most common items. The average occurrence rate of all items across the nine building blocks was calculated to be 14.9%. Therefore, If an item from Table 1 appeared in more than 15% of the cases, we collected additional qualitative data from the sources. If an item appeared in less than 15% of the cases, it was noted but not deemed significant enough to warrant further detailed investigation. In **Annex 1** of this document, we provide a detailed evaluation of the most effective business practices across different shared mobility modes.

Remark: To decide which business model components should be analysed further, two methods could be considered. The statistical test (i.e. 95% confidence intervals and Z-scores) that checks if an item's frequency was significantly above or below a reference level. And, the average frequency of all items across the nine BMC building blocks on the other hand, checks what percentage of occurrence is representative. Accordingly, the statistical approach shows that only items appearing in over 42.4% of sources could be considered significant at a 95% confidence level. Given the dataset's diversity, this threshold which is based on the highest upper confidence interval bound among non-significant items is very high. Many components that frequently appear and hold importance to explore would be excluded if such a strict threshold were applied and would have limit us to explore items that are not normally considered in standard BMC building blocks. In comparison, the average occurrence rate across all building block contents was 14.9%. Therefore, this showed us that the 15% value would better reflects the frequency of appearances with more items to explore.

3.4 Expert Survey on Integrated and Seamless Shared Urban Mobility Business and Operation

In this activity, we aimed to explore how various elements within business structures can serve as pivotal decision support in our ongoing analysis of control and governance mechanism for business viability assessment. The insights gathered from this survey will be complementary in shaping our approach to the design and implementation of a broad spectrum of mobility services, both within the SUM project and in future endeavours. **Annex 2** represents the original format of the survey questionnaire.

Our objective was to survey a minimum of 150 experts throughout Europe. We began by sending the questionnaire to more than 400 potential experts across Europe. From this, we received 177 responses. After refining the dataset to ensure the quality and completeness of the data, 134 responses were considered usable for this study. The participants were from Germany, France, Greece, Austria, Netherlands, Norway, Finland, Switzerland, Spain, Portugal, Poland, Sweden, Belgium, Israel, Cyprus, Italy, and Turkey. **Table 2** shows the percentage of participants per type of organization involved in the study.

Table 2 - Percentage Distribution of Participants in the Expert Survey by Organization Type

Type of organization	Percentage of Participants %
Public Transportation Operator (PTO)	6%
Non-Public Transportation Operator (Non-PTO)	6%
Government or Regulatory Agency	10.2%
Private Sector Mobility Provider (e.g., Technology, Ticketing, Data, etc.)	11%
Non-Profit or Advocacy Group	8.5%
Academic or Research Institutions	48%
Manufacturers (e.g., Original Equipment Manufacturer (OEMs))	1.1%
Public Transportation Association (PTA)	0.6%
Public Sector Mobility Provider (e.g., Technology, Ticketing, Data, etc.)	5%
No answer	4%

Here are the 13 questions that were asked through both multiple-choice (closed-answer model) and explanatory comment options, as well as some open-answer questions:

Governance and control

1. Considering the structure of current urban mobility business operations and different business models of urban mobility providers in your city, how can the management of an integrated and seamless shared urban mobility ecosystem be structured to facilitate its emergence into a market reality?
2. From the viewpoint of a shared urban mobility service provider, what do you believe are the main potential challenges in integrating shared mobility into the existing infrastructure to achieve a seamless ecosystem?
3. From the viewpoint of the shared mobility service users, what do you believe are the main potential barriers that might deter their willingness to accept or use the offered solutions?
4. What do you believe are the main potential business viability enablers when trying to establish an integrated and seamless shared mobility ecosystem?

Integration of Shared Mobility Solutions with Existing Services

5. New shared mobility (NSM) services are changing the mobility landscape in our cities, yet this shift often raises significant concerns. For each type of shared mobility solution, what are the critical concerns that need to be addressed today?
6. Which key activities today remain underdeveloped for achieving a viable business ecosystem of integrated shared mobility and PT services?

Stakeholders

7. How important and effective it is to involve the following stakeholders to implement viable seamless shared urban mobility business operations?
8. In a seamless shared urban mobility ecosystem with many stakeholders/actors involved, which type of organization should lead the coordination?
9. To what extent would the following cost factors burden operators who might participate in integrated and seamless shared mobility solutions?
10. How would you rate the effectiveness of the following push and pull measures in achieving seamless shared urban mobility business operation?
11. What criteria should be used to determine the success of a seamless integrated shared mobility business operation, especially for mobility platform providers (e.g. MaaS Bundles)?
12. Which performance indicators would you consider to assess the success of integrated and seamless shared urban mobility business operation?
13. Are there any important aspects of the seamless shared urban mobility business ecosystem that were NOT covered in this survey but you believe should be taken into account? Please elaborate on your suggestions.

Remark: The objective of WP5 Task5.3 was to collect insights from a minimum of 150 experts across Europe. To achieve this, we initially distributed the questionnaire to over 400 potential experts and stakeholders involved in mobility-related initiatives within Europe. This outreach resulted in 177 valid responses, thereby surpassing the stated minimum threshold of 150 expert inputs.

However, to reach the extended target of 200 expert interviews, the study will continue stakeholder engagement beyond the initial survey phase, which involved 177 experts. In the later phase of Task 5.3, during the preparation of Deliverable D5.4, conducting interviews with an additional 30 to 40 stakeholders will allow us to build upon the survey findings and provide a more integrated and comprehensive analysis of the mobility ecosystem, as required for the final output. This combined approach ensured that we fulfilled the higher threshold mentioned in the GA deliverable description, while maintaining methodological coherence throughout the work.

4 Results: Best Practice Analysis

4.1 Value Proposition

4.1.1 Product and Services

The value proposition may be where the classification adopted in this report has shown stiffness. A more detailed composition would have been beneficial. Qualitative data from the articles reviewed will complement the figure. The principal Value Proposition is the **type of sharing** (67% of occurrences) (**Figure 5**). For most of the case studies, it refers to the implementation of a mode which did not existed as a shared mode (Burghard and Dütschke, 2019; Cui et al., 2023; Guyader and Piscicelli, 2019; Kao et al., 2019; Lan et al., 2017).

The second type of value proposition is the **area of coverage** (36% of occurrences), where the services are implemented. Mentioned earlier, the partnership between Uber and the rural town of Innisfil, Ontario (Benaroya et al., 2023) allowed to offer a new mobility service where the alternatives to the private car are scarce (see also (Polydoropoulou et al., 2020)). In more populated areas, other companies offer a service where they are pertinent. By example, car sharing in the city center benefits from pressure against the ownership of private car. The population density makes the city space rare and valuable. Carsharing services can become an alternative to car ownership. The city may keep a number of parking slots for these services which help them become more attractive as the city of Bremen has done (Arndt et al., 2019). Furthermore, these services often offer electric vehicles, for which parking is often free of charge, reducing the cost of intermediary stops along the trip of a carsharing user. The area of coverage can also be a reference to the quality of the station network of the service. In (Karbaumer and Metz, 2021), the network stations (plus the large and available bike fleet) of the Bergen bicycles is cited. It allows to reduce the uncertainties of the parking searching phase and to increase the comfort.

The third most important value proposition is the **Service Integration** (with 31% of occurrences). The integration of the service within one app where it is possible do multiples operations, such as routing, booking and payment (Polydoropoulou et al., 2020) is a value proposition. The integration of other offers, such as partnering with NS, the Dutch railway company, allowing for seamless trips with train and car-sharing service (Melis et al., 2020). Lastly **Personnalization** (19%) allows a service to attract more users. The Enterprise Car Club of Edinburgh offers vehicles dedicated to different tastes (electric, petrol-fuelled, hybrid / automatic or manual transmission) (Karbaumer and Metz, 2021).

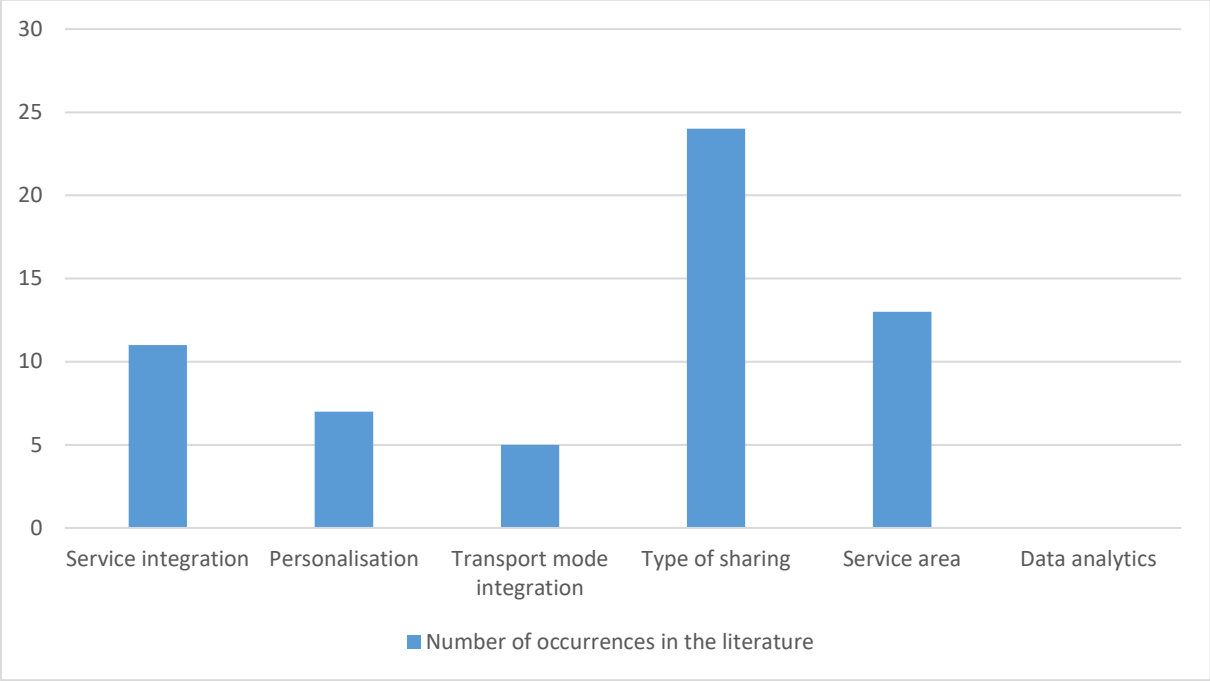

Figure 5 - Value proposition dimension: Product and Services Building Block

4.1.2 Customer Structure Relationships

The most important Customer Structure Relationships is the **Customer Service** (28%) (**Figure 6**). As mentioned previously, the marketing is one of the main activities of the NSM.

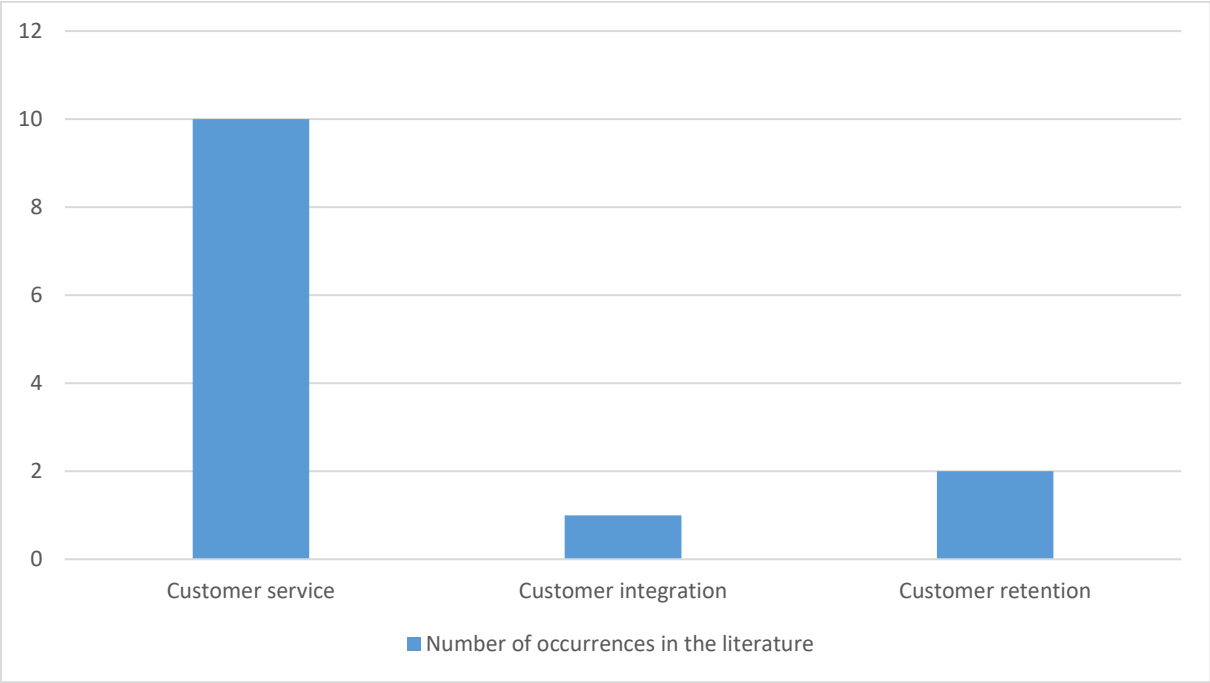

Figure 6 - Value proposition dimension: Customer Structure Relationships Building Block

4.1.3 Customer Segments

The main customer segment is the **Customer Type** (47% of occurrences) (**Figure 7**). Although, NSM services cannot be defined as a niche service, NSM have a specific userbase. For car sharing services, it is urban residents without a car (Monteiro et al., 2023). For Shared Autonomous Vehicles, the public will likely come from those walking, cycling or using public transit (Khan et al., 2023). For dock-based service, they identified that a lot of customers were coming from areas with decent bus station coverage but no metro stations (Cui et al., 2023). For scooters, the users were mostly young urban commuters, travelling their last-mile (Kao et al., 2019).

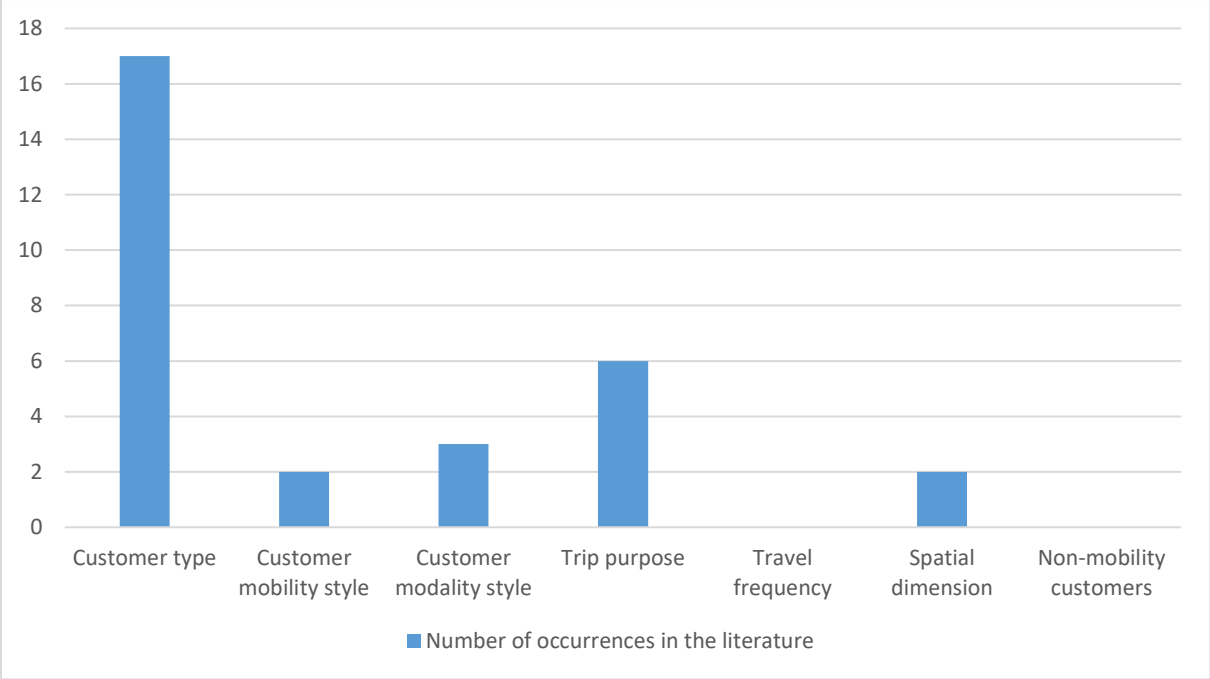

Figure 7 - Value proposition dimension: Customer Segments Building Block

4.2 Value creation and delivery

4.2.1 Key Partners and Suppliers

The main key partners and supplier category for implementing a shared mobility service is the **public partner category** (**Figure 8**). The most common one is the **local government** (56% of occurrences) paired with multiple other local public partners such as **public transport operators** (33% of occurrences), **Transport infrastructure providers** (22% of occurrences). It is advised to include the local public authority from the start to avoid misunderstandings and fears of nuisances from the new shared mobility (Lan et al., 2017; Rodriguez and Mizaras, 2020). Furthermore, discussions with the local government can lead to a situation of relative monopoly for the operator (Melis et al., 2020).

The local government, which may have overlapping responsibilities with the **local infrastructure provider** is also key for services which require parking space such as bike sharing, scooter sharing, carsharing or carpooling (Lan et al., 2017; Melis et al., 2020). The local government is also a subsidies provider, often required to a transport service (ridesharing, carsharing) (Arndt et al., 2019; Mangeart, 2023a). This is highlighted in (Benaroya et al., 2023), for which the Transportation Network Companies (TNC) Uber has

benefited from subsidies to operate a service in rural areas where the service would have been unprofitable. The need to work with existing operator enables a seamless mobility experience (*Evaluation of shared mobility to support decarbonisation*, 2021; Melis et al., 2020). As for the private sector, both **OEMs** (Original Equipment Manufacturer, with 19% of occurrences) and **private transport operators** (14%), if not essential, appear to be important partners to have. They might be of more importance for actors which need to invest in a fleet of vehicles, to rent the vehicles or to delegate the service operation (Arndt et al., 2019).

The last two partnerships of importance (both with 14% of occurrences) are the **investors** and the **insurance** companies as the investment market for mobility has been dynamic over the last decade. The implementation of bike and scooter sharing services leveraged important capital fundraising at the end of the 2020 decade (Mangeart, 2023b). The implementation of car sharing (both B2C and P2P) on the other hand have participated to the emergence of a new market for the insurance companies.

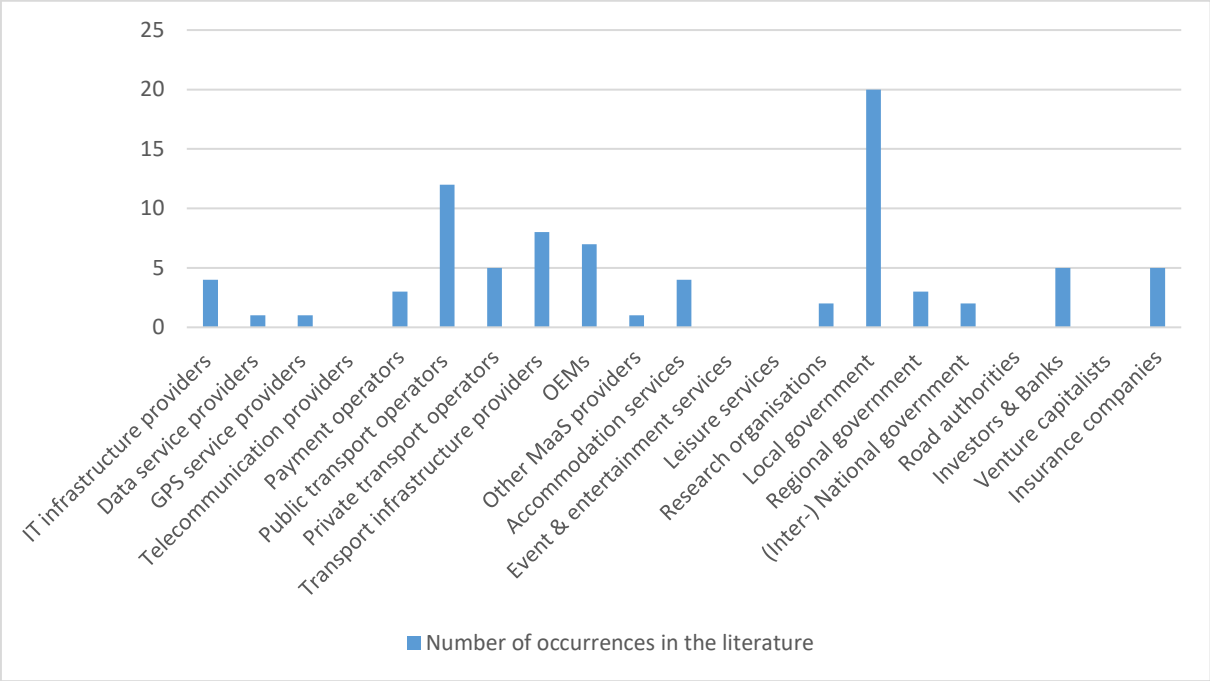

Figure 8 - Value creation and delivery dimension: Key Partners and Suppliers Building Block

Expert Survey Support

Question: How important and effective it is to involve the following stakeholders to implement viable seamless shared urban mobility business operations?

Discussion: The findings from best practices in various shared mobility initiatives align with expert opinions on the importance of a seamless business ecosystem (**Figure 9**). The analysis of best practices highlights that the strategic partnerships with **local governments**, **PTOs, infrastructure providers**, **OEMs**, and **private transport operators** are crucial for success. Local governments play a key role in providing infrastructure and subsidies, while PTOs and infrastructure providers enhance service integration. Private partners, such as OEMs and transport operators, are vital for vehicle investments and operations, and investors and insurance companies provide financial support.

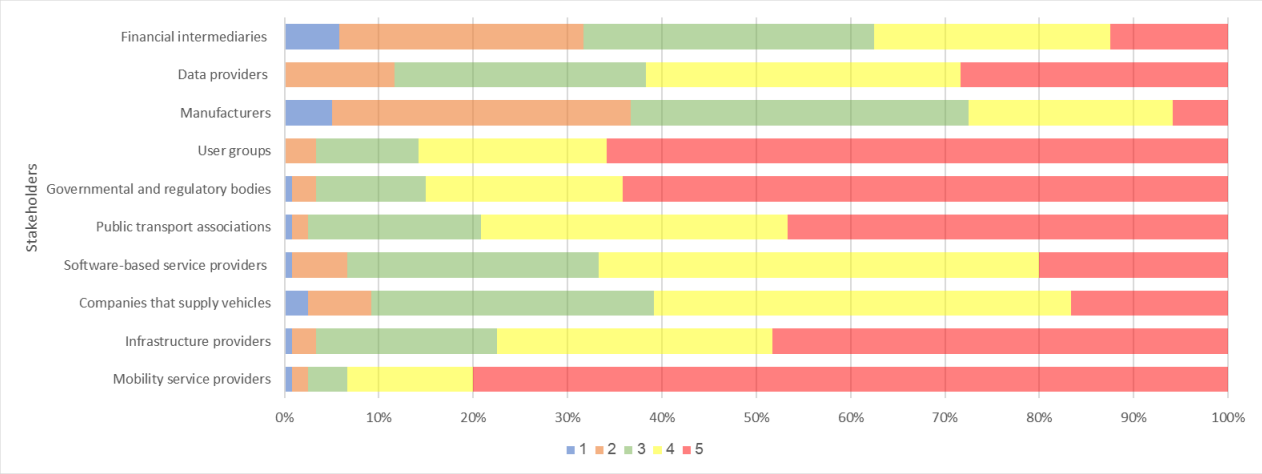

Figure 9 - Value creation and delivery dimension: Expert Survey on Key Stakeholders to Implement a Viable Business

* The ranks are in order of importance (1-least important to 5-most important).

Experts emphasize that for seamless shared urban mobility, the most important stakeholders are **mobility service providers**, **user groups**, **governmental and regulatory bodies**, and **infrastructure providers**. This alignment shows that the key partners identified in best practices are also considered essential by experts for creating a seamless business ecosystem. It indicates that stakeholders and actors in the shared mobility sector understand the importance of these partnerships and working towards integrated and sustainable urban mobility solutions. This convergence underscores the shared recognition of the need for comprehensive collaboration to achieve viable and seamless mobility services.

4.2.2 Key Activities

The most important activity is **fleet management** which appears in two third (67% of occurrences) of our use cases studied (**Figure 10**). As most of the NSM, such as carsharing, bike-sharing or scooter-sharing, the fleet is a key item of the service offered (Cui et al., 2023; Karbaumer and Metz, 2021; Monteiro et al., 2023). The second activity is the **marketing** (61% of occurrences), which might be explained by the relative novelty of these services. These services need to be known to be used. Most of them have the advantage to benefit from an on-street vehicles fleet. The Bergen City Bicycle in Bergen, Norway says "The best marketing is the high visibility in the cityscape and the high usage, all year round.", a strategy used with highly visible and recognizable blue bikes (Karbaumer and Metz, 2021).

The third activity is **booking** (33%), explained by the typology of the NSM actors. A share of them offers platform to help mobility demand and supply to meet. It is the case for TNC companies, MaaS's platforms or P2P carsharing actors. These platforms are often integrated as 22% of the use cases have the Information technology **(IT) platform development** as one of their key activities.

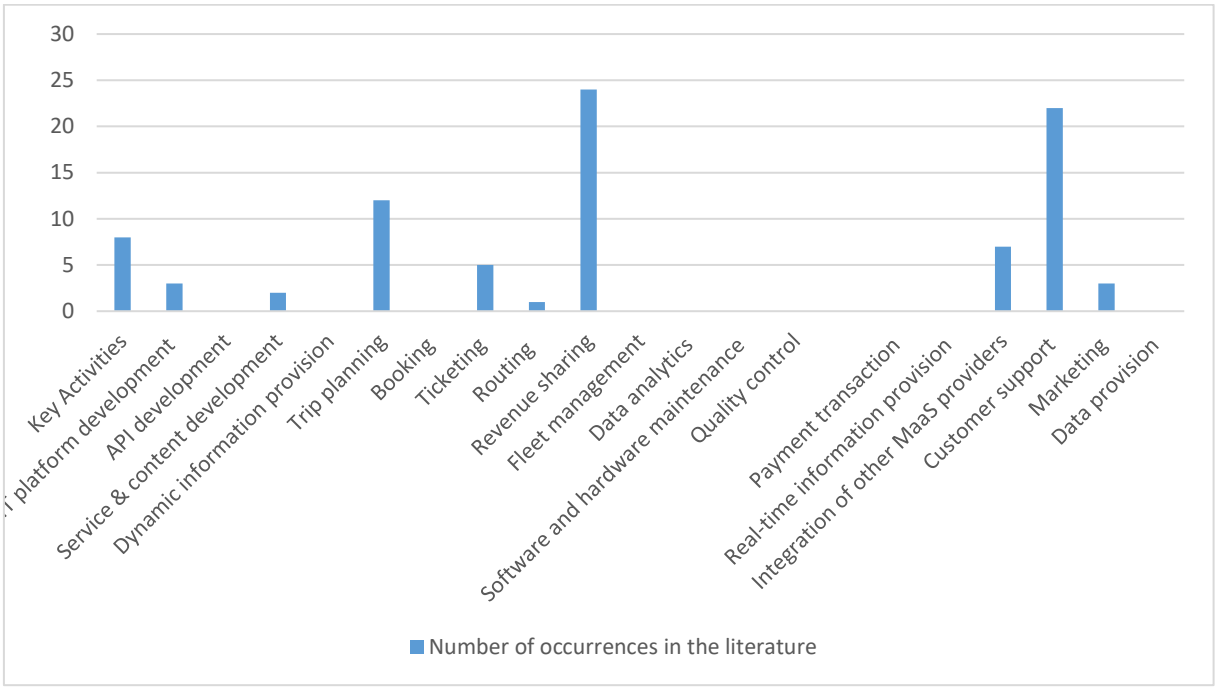

Figure 10 - Value creation and delivery dimension: Key Activities Building Block

Expert Survey Support

Question: Which key activities today remain underdeveloped for achieving a viable business ecosystem of integrated shared mobility and public transport services?

Discussion: The analysis of best practices in shared mobility services identifies **fleet management**, **marketing**, and **IT platform development** as the most critical activities. Fleet management is central to services such as carsharing, bike-sharing, and scooter-sharing. Marketing is essential due to the novelty of these services, requiring significant visibility to attract users. Additionally, IT platform development underscores the importance of integrating technology to support these services.

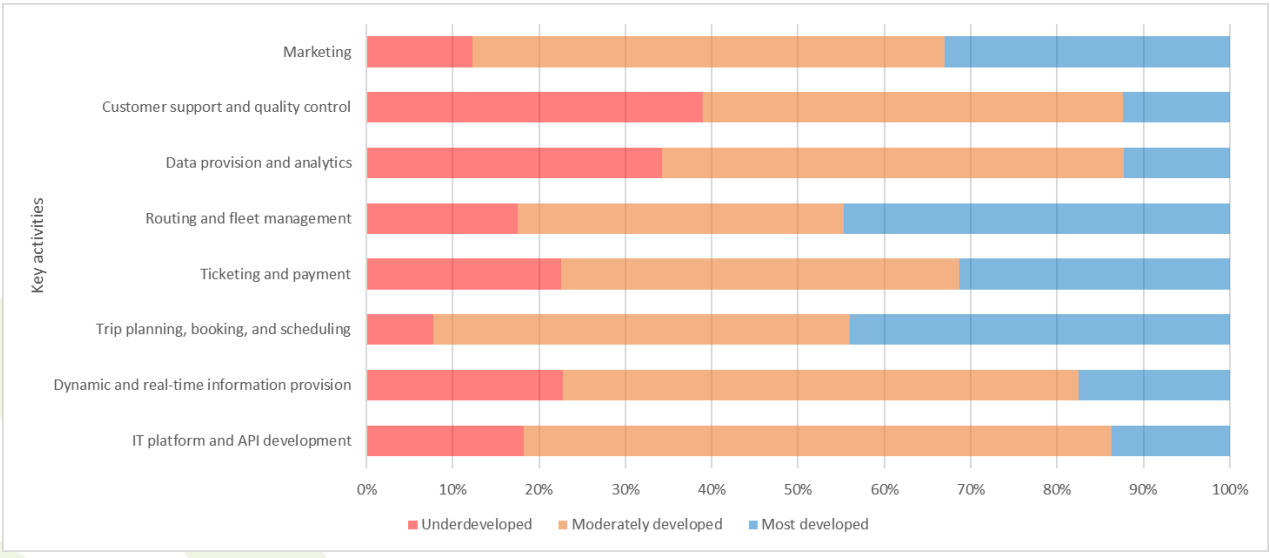

Figure 11 - Value creation and delivery dimension: Expert Survey on Key Activities for Viable Integrated Mobility Ecosystems

Expert opinions on seamless shared urban mobility provide further insights into the status of these key activities (**Figure 11**). While **fleet management** and **IT platform development** are considered among the most developed activities, **marketing** is seen as moderately developed. The expert survey also highlights that **dynamic real-time information provision** and **trip planning**, **booking**, and **scheduling** are well-developed, indicating robust support for seamless operations. However, **data provision and analytics**, as well as **customer support and quality control**, are underdeveloped and require significant attention. This alignment shows that while many critical activities identified in best practices are well-addressed, focusing on the underdeveloped areas is crucial for achieving a seamless and integrated mobility ecosystem.

4.2.3 Key Resources

The Key Resources concern resources required to deliver the Value Propositions. When the **fleet management** is the main activity of the NSM actors, the principal resources needed would be the **vehicle** (67% of occurrences) (**Figure 12**). They can either be acquired by the operator such as for the bike sharing (Vélib' in Paris, Vélostar in Rennes France or Vélov' in Lyon, France or scooter-sharing companies) or owned by third parties. On the other hand, the TNC companies usually rely on independent vehicle-owners and drivers. Mirroring the **IT platform development** in the key activities mentioned above, the second most cited key resource was the Technological platform (33% of occurrences), with the additional 14% of the **Users and driver apps**. As mentioned early, the platform may even be the only service provided by the NSM actor.

For those operating a mobility service, the need for **Transport infrastructure** (mostly parking spot) may be seen as critical. The occurrences are only at 22% but it echoes with the 22% seen previously in the key partnership section. Monteiro et al. 2023) highlights the importance of creating hubs for shared cars. Lastly, the **Human Resources** is mentioned to be an important resource. The development of the apps/technological platform represents a challenge. Developers can be difficult to attract and retain (Kao et al., 2019).

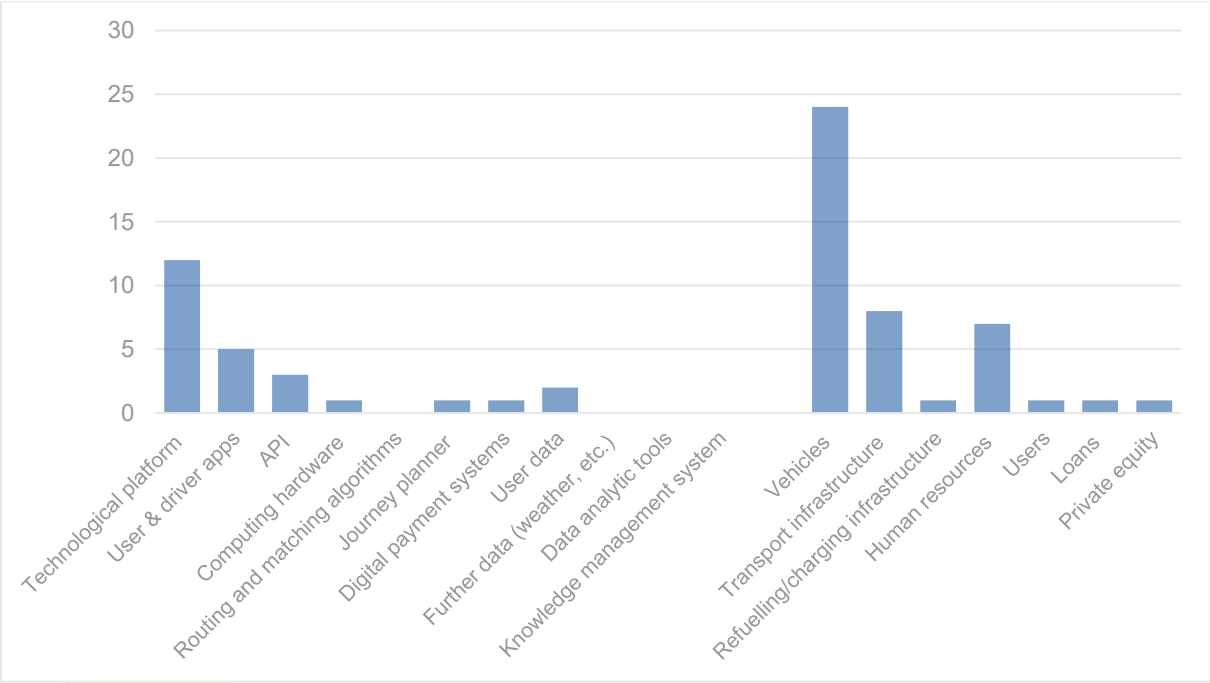

Figure 12 - Value creation and delivery dimension: Key Resources Building Block

Discussion: The key resources in shared mobility services align closely with the key activities. **Fleet management**, the primary activity for many shared mobility actors, necessitates vehicles as the principal resource. These vehicles can be operator-owned, or owned by third parties. **Technological platforms**, crucial for IT platform development, are the second most cited key resource. **Transport infrastructure**, particularly **parking spots**, is critical reflecting the need for **dedicated mobility hubs** for shared vehicles. Lastly, **human resources**, particularly developers for **app and platform development**, are vital yet challenging to secure and retain.

4.2.4 Customer Channels

The most important channel are the **distribution channels** (36 % of occurrences) (**Figure 13**). Followed by **communication channels** (33%), without surprise as most of the NSM rely on apps.

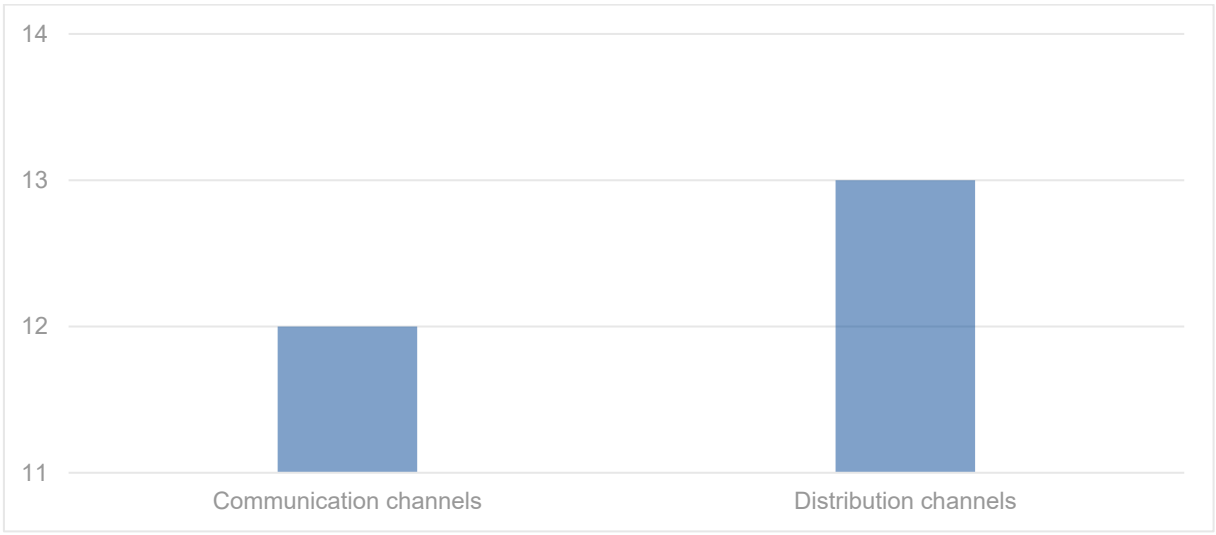

Figure 13 - Value creation and delivery dimension: Customer Channels Building Block

4.3 Value capture

4.3.1 Cost Structure

The costs are a less addressed topic that this sub-topic (**Figure 14**). The principal costs are the **Operational costs** (36% of occurrences). Operational costs are often related to fleet management, including maintenance (which is sometimes undervalued (Lan et al., 2017)), charging (Kao et al., 2019), and insurances (Bredewout, 2021). The maintenance of the app (Kao et al., 2019; Polydoropoulou et al., 2020) and marketing costs are also a share of the operational costs (Polydoropoulou et al., 2020). The **Investment costs** are mostly related to the investment made to acquire vehicles (Bredewout, 2021; Kao et al., 2019) and to the development of the app/technological platform (Kao et al., 2019; Polydoropoulou et al., 2020).

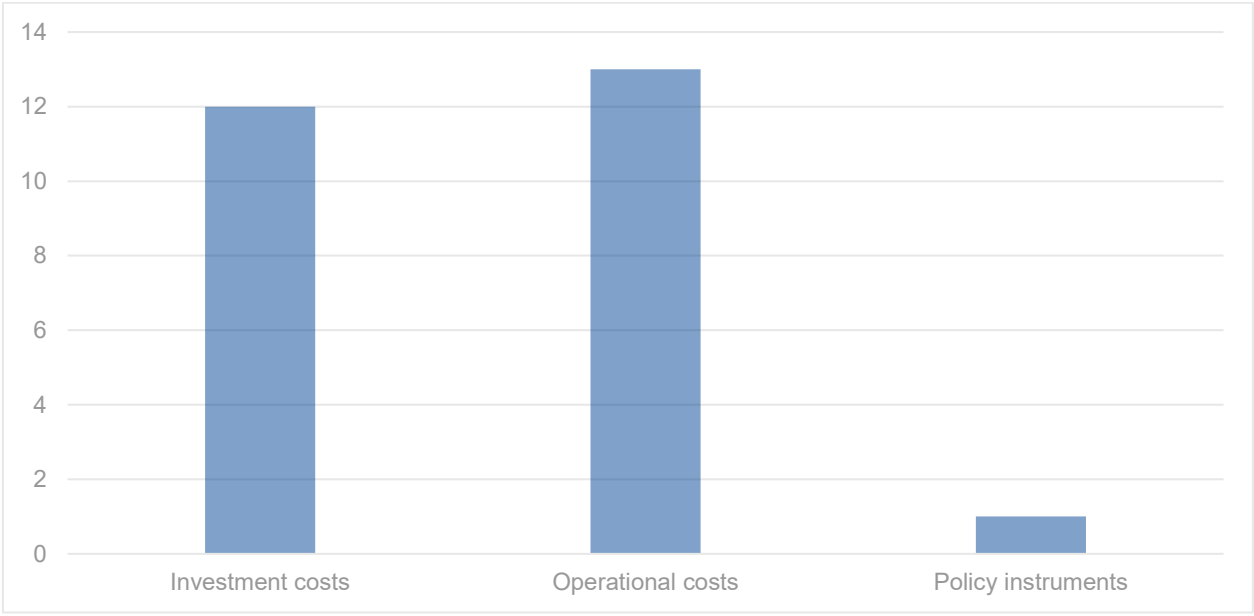

Figure 14 - Value capture dimension: Cost Structure Building Block

Expert Survey Support

Question: To what extent would the following cost factors burden operators who might participate in integrated and seamless shared mobility solutions?

The survey (**Figure 15**) reflects a high prioritization of fleet maintenance, which aligns with the best practice study's identification of fleet management, including maintenance and charging, as a significant portion of operational costs. The survey data underscores this with fleet maintenance scoring highly on importance (44.17% rating it 4 and 22.50% rating it 5). The best practice study also highlights insurance costs and maintenance of the app as key operational expenses, which corresponds to the survey's recognition of insurance and legal-related costs and software maintenance as considerable concerns. The survey further illustrates the importance of data integration and marketing costs, underlining their role in enhancing service delivery and customer engagement.

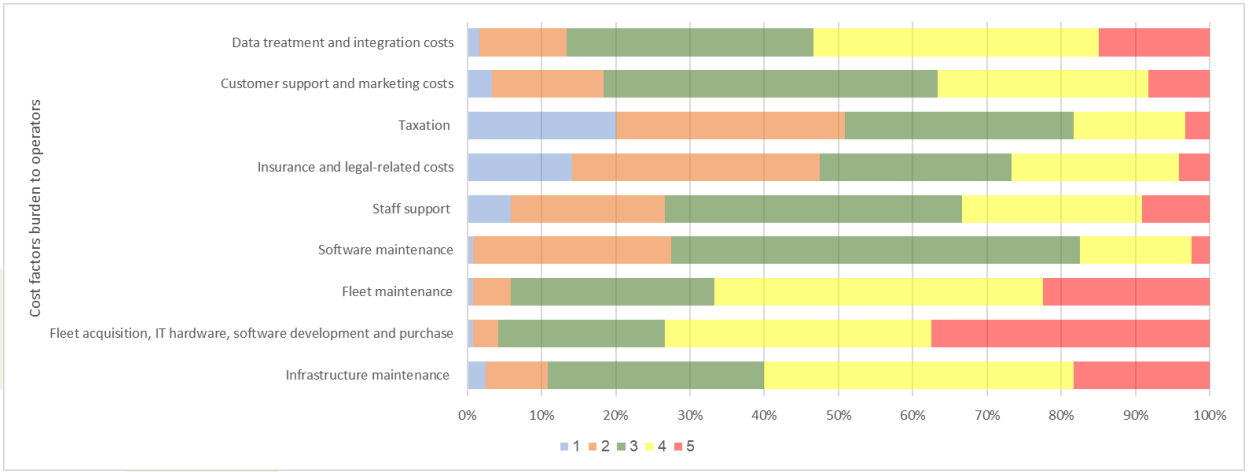

Figure 15 - Cost structure: Expert Survey on cost factors burden operators participating in integrated and seamless shared mobility solutions

* The ranks are in order of importance (1-least important to 5-most important).

Discussion: The expert survey on cost factors in the shared urban mobility ecosystem identifies key areas of financial concern, particularly emphasizing infrastructure maintenance, fleet management (including acquisition and maintenance), and technological investments like IT hardware and software development. These findings correlate strongly with best practice studies, which highlight operational costs - especially related to fleet management, insurances, and app maintenance - as significant.

4.3.2 Revenue Streams

The revenue streams can be divided in several ways. The subscription, fees or fares paid by the users and subsidies paid by the government. For non-transport operators such as MaaS platform, the economic model relies on commissions (**Figure 16**). The most common **Fares** (39%) (pricing scheme) is the subscription, which is the most popular solution (Bredewout, 2021; Melis et al., 2020; Polydoropoulou et al., 2020). It creates a predictable revenue stream and contributes to system long-term operations (Melis et al., 2020). It is also usual to find pre-use fares (Bredewout, 2021; Cui et al., 2023; Kao et al., 2019; Münzel et al., 2018) or package such as 10-trips bundle.

Fees (33% of occurrences) can be found for carsharing services (Münzel et al., 2018; Sopjani et al., 2020), carpooling (Guyader and Piscicelli, 2019) or MaaS (Polydoropoulou et al., 2020). Another major source of income for NSM, not included in the nomenclature is the **Subsidies**. They can represent more than two third of the total income of the company (Arndt et al., 2019).

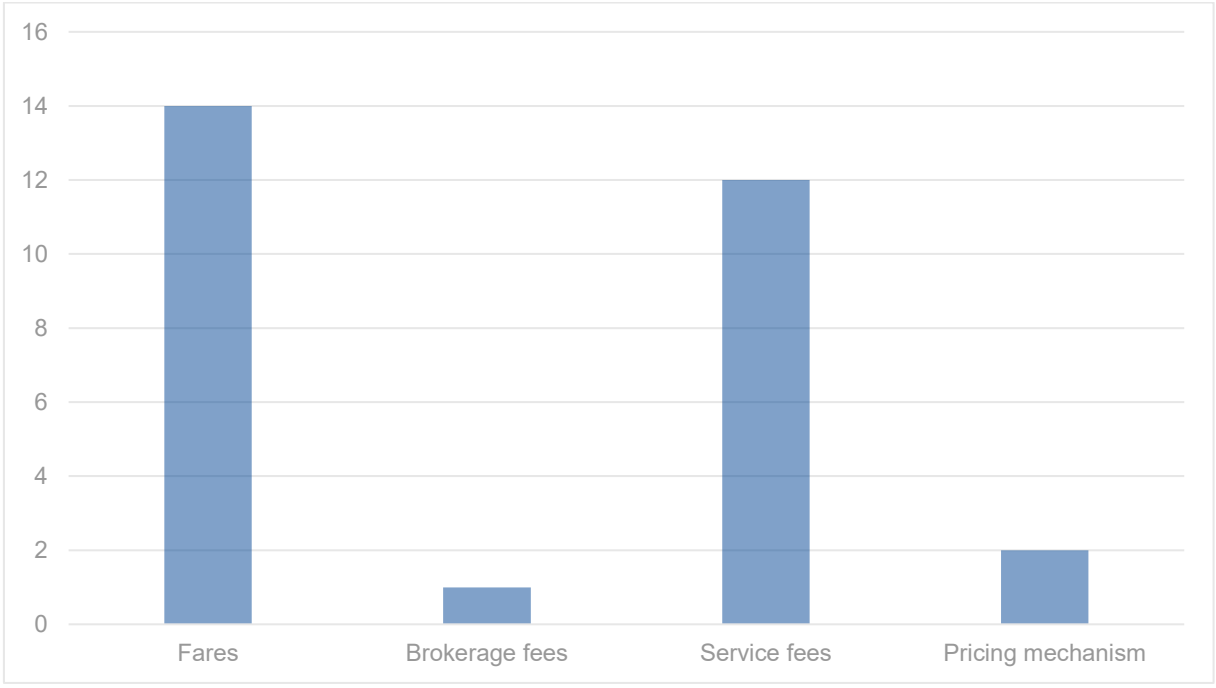

Figure 16 - Value capture dimension: Revenue Streams Building Block

5 Results: Expert Survey

Within the SUM proposal, online expert survey and workshops with the SUM living lab stakeholders have been planned. The first task which is expert surveys is covered in this Deliverable D5.3. The aim of this expert questionnaire is to interview experts in the field of shared mobility and PT operation identifying factors in implementation of urban mobility services within the context of content, control and governance. **Annex 2** represents the developed online questionnaire.

The online expert questionnaire targeted different types of public and private stakeholders, mostly working in the field of shared mobility and public transportation:

- Public Transportation Operator (PTO)
- Non-Public Transportation Operator (Non-PTO)
- Government or Regulatory Agency
- Private Sector Mobility Provider (e.g., Technology, Ticketing, Data, etc.)
- Non-Profit or Advocacy Group
- Academic or Research Institutions
- Manufacturers (e.g., OEMs)
- Public Transportation Association (PTA)
- Public Sector Mobility Provider (e.g., Technology, Ticketing, Data, etc.)

The questionnaire covers different content, control and governance aspects:

1. Considering the structure of current urban mobility business operations and different business models of urban mobility providers in your city, how can the management of an integrated and seamless shared urban mobility ecosystem be structured to facilitate its emergence into a market reality?

The question explores potential frameworks for managing an integrated and seamless shared urban mobility ecosystem. It seeks to understand the most effective structural approaches to transform these systems into viable market realities. It reveals insights into how experts believe the management of an integrated and seamless shared urban mobility ecosystem can be structured (**Figure 17**). The options provided range from local to global scales, each emphasizing different actors and governance styles:

- Through Multi-local market initiatives (i.e., including local entities focusing on local actors, needs, and conditions)
- Through global stakeholder community initiatives (i.e., including multi-national entities focusing on global actors)
- Through integrated mobility start-up community and transport authority initiatives
- Through top-down governance driving initiatives (i.e., considering the multidimensional role of the public sector)
- Through regional governance initiatives (i.e., bringing various municipalities together under one organizing body and designing and funding projects and infrastructure through a single municipal planning organization)

The results show varying levels of support for different initiatives: Multi-local market initiatives received 51.7% support, global stakeholder community initiatives garnered 21.7%, integrated mobility start-up community and transport authority initiatives had 52.5%, top-down governance driving initiatives were supported by 62.5%, regional governance initiatives had the highest support at 70%.

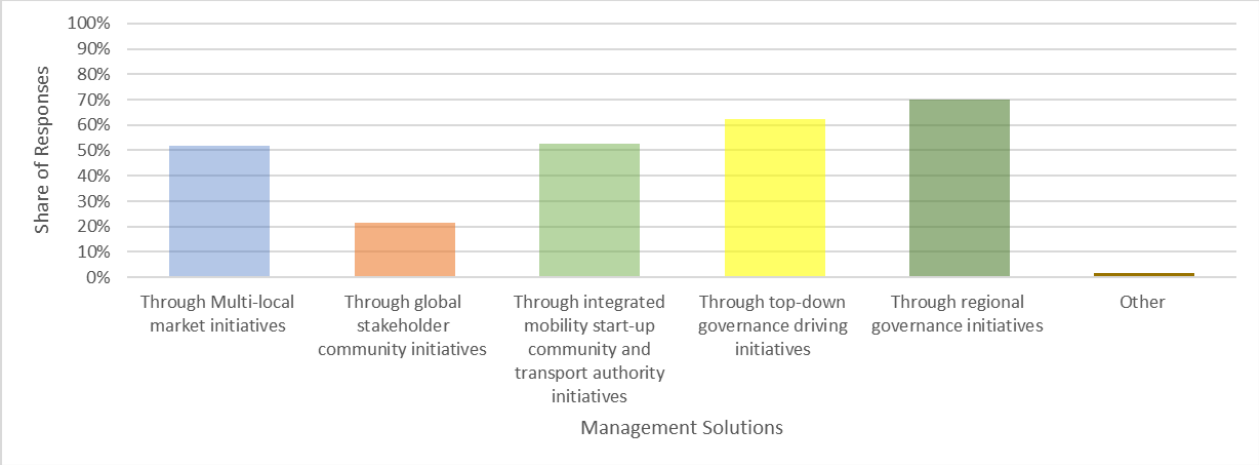

Figure 17 - Governance dimension: Expert Survey on Ecosystemic management to facilitate emergence of seamless mobility into a market reality

Discussion:

"Experts supporting **multi-local market initiatives** highlighted several points. The local PTO is seen as the natural entry point for these initiatives. Cooperative efforts that try to accommodate different local needs (similar socio-demographic and environmental characteristics) are essential, and the inclusion of local communities and authorities is emphasized. Inspiration and implementation on a local scale can also help in accommodating specific local characteristics. The notion of an Uber-like model that works everywhere but respects local contexts is another aspect which highlighted.

Global stakeholder community initiatives were supported for their ability to leverage international and global scales. Experts mentioned that PTOs like Keolis, RATP and Transdev can deploy NSMs in all local contracts, boosting deployment with limited commercial effort for NSM startups.

In the integrated **mobility start-up community and transport authority initiatives**, experts emphasize the role of start-ups in driving innovation. They believe that a value creation mindset should be promoted among start-ups and transport authorities since the very beginning. Local initiatives could act as a springboard, with the potential to scale if successful. However, the necessity for agreement and cooperation between different parties was stressed. Mixed governance for large scale deployments were seen as potentially effective if well-coordinated.

Top-down governance is considered crucial by many experts for its regulatory capabilities. Funding for public transportation infrastructure and operations was noted as essential. Regulating is necessary, especially when local monopoly markets are needed (to achieve business model equilibrium for NSM startups and clarity for users). Financial incentives from local and regional authorities are much needed to support the deployment of the solutions & its accessibility to less "profitable" areas or categories of travellers. A well-regulated top-down approach could ensure consistency and reliability in service delivery.

Regional governance initiatives received the highest support. Experts pointed out that this approach aligns well with how public transportation is organized in many regions, such as in Sweden and France. Regional tools can provide the right scale for deployment and managing PT effectively. Conciliation of local transport authorities and addressing specific regional needs can be more efficiently managed at this level. Combating the stigma of using PT, especially among younger populations, was also highlighted. It is also highlighted that shared mobility is a very local business so it should take place on local level plus the nationwide standardization of Application programming interfaces (APIs) into MaaS applications.

Small fraction of experts selected "**Other**" indicating that the majority of opinions were well-captured by the predefined choices. It is highlighted that it is necessary to combat the stigma of using public transportation

as solely a means of travel for those who cannot afford private cars. Also, it is mentioned that among younger population, it's essential to make public transportation attractive and to rebrand it as something cool.

2. From the viewpoint of a shared urban mobility service provider, what do you believe are the main potential challenges in integrating shared mobility into the existing infrastructure to achieve a seamless ecosystem?

The question focuses on identifying the principal challenges that shared urban mobility service providers might face when attempting to integrate their services into the existing infrastructure to create a seamless urban mobility ecosystem. The **Figure 18** indicates the main potential challenges in integrating shared mobility into the existing infrastructure to achieve a seamless ecosystem.

Experts ranked the challenges on a scale from 1 to 5, where 1 is the least important and 5 is the most important. "Regulatory and Legal" challenges are considered the most critical by the experts, with 38.33% rating them as 5 (most important). This is closely followed by "Business" challenges, which 35% of experts rated as 5. "Economic and Financial" challenges are also significant, with 27.5% of respondents giving them the highest importance rating. "Organizational" challenges are similarly important, rated as 5 by 27.5% of respondents and as 4 by 39.17%. "Technological and Technical" challenges received lower emphasis at the highest importance level (8.33% for 5), with the majority rating it between 2 and 3. "Topological," "User Acceptance," and "Social Acceptance and Community" challenges have more moderate ratings, indicating a balanced view among the experts regarding their importance.

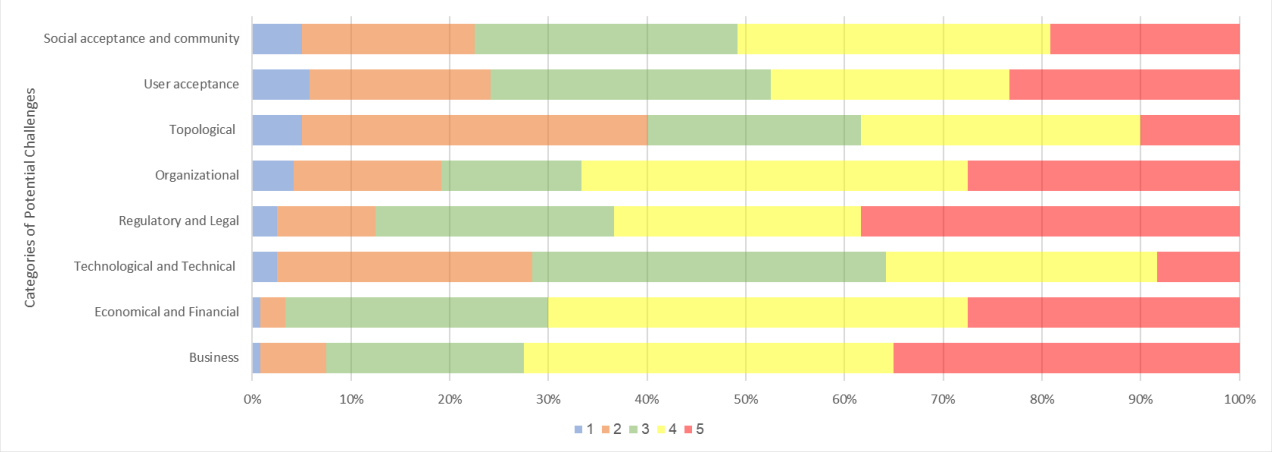

Figure 18 - Challenges: Expert Survey on main potential challenges in integrating shared mobility into the existing infrastructure to achieve a seamless ecosystem

* The ranks are in order of importance (1-least important to 5-most important).

Discussion:

Regulatory and legal challenges fall under the "**Key Partnerships**" and "**Customer Relationships**" building blocks. Navigating regulatory landscapes, compliance, and legal frameworks are essential for maintaining operational legitimacy and building trust with customers. Challenges relating to **business** directly relates to the "**Key Activities**" and "**Value Propositions**" blocks. It involves the operational aspects of integrating shared mobility services, managing partnerships, and ensuring that the value offered meets market demands. **Economical and financial** challenges correspond to the "**Cost Structure**" and "**Revenue Streams**" blocks. Financial sustainability, investment requirements, and economic viability are critical to the long-term success of shared mobility services. **Organizational** challenges impact the "**Key Resources**" and

"**Channels**" blocks. Organizational structure, internal capabilities, and effective communication channels are vital for efficient service delivery and market penetration.

Technological and technical challenge as a part of **Sustainability-Oriented Business Reflection** relates to the "**Key Resources**" and "**Key Activities**" blocks. Technology infrastructure, technical integration with existing systems, and innovation capabilities (i.e. Automation, Digitisation and Electrification) are crucial for seamless operation and user experience. **Topological** challenge typically affects the "**Customer Segments**" blocks, concerning the geographical integration of services. **User acceptance** challenge aligns with the "**Customer Segments**" and "**Value Propositions**" blocks. Ensuring that users accept and adopt the new services is critical for market penetration and user retention. Finally **social acceptance and community** challenge relates to the "**Customer Relationships**" and "**Customer Segments**" blocks. Building social acceptance and community support is necessary for the broader acceptance of shared mobility services.

3. From the viewpoint of the shared mobility service users, what do you believe are the main potential barriers that might deter their willingness to accept or use the offered solutions?

Insufficient incentive is seen as the most significant barrier, with 33.33% of respondents rating it as a 5, and 29.17% rating it as a 4 (**Figure 19**). **Limited-service coverage** follows closely, with 29.17% rating it as a 5 and 45% as a 4. **Safety and Trust** is also a significant barrier, with 22.5% rating it as a 5 and 25% as a 4. **Desire to travel alone** is notable, with 14.17% rating it as a 5 and 37.5% as a 4. **Ticketing and payment difficulties** pose another barrier, rated as a 5 by 15.83% and as a 4 by 32.5%.

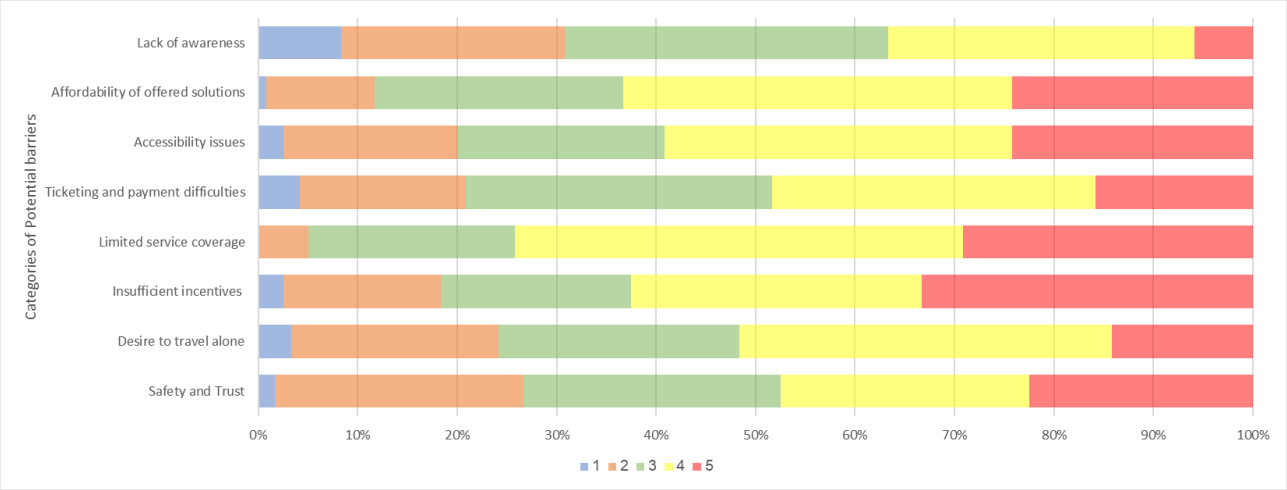

Figure 19 - Barriers: Expert Survey on main potential barriers deterring the willingness of users to accept or use the offered solutions

* The ranks are in order of importance (1-least important to 5-most important).

Discussion: Safety and trust are considered barriers that relate to the "**Value Propositions**" and "**Customer Relationships**" blocks. Ensuring that users feel safe and trust the service is critical for gaining and maintaining users. **Desire to travel alone** barrier impacts the "**Customer Segments**" and "**Customer Relationships**" blocks. Understanding **user preferences** and catering to those who prefer solo travel can influence service design and marketing strategies. **Insufficient Incentives** connects to the "**Revenue Streams**" and "**Value Propositions**" blocks. Providing adequate incentives is crucial for attracting and retaining users, impacting the perceived value and pricing strategies. **Limited-Service Coverage** relates to "**Customer Segments**" blocks. Expanding service coverage is essential for reaching a wider audience and ensuring accessibility. **Ticketing and Payment Difficulties** impacts the "**Channels**" and "**Customer Relationships**" blocks. Simplifying the ticketing and payment processes can enhance user experience and

reduce friction in service adoption. **Accessibility** Issues connects to the "**Channels**" and "**Customer Segments**" blocks as well. Ensuring that services are accessible to all potential users, including those with disabilities, is vital for inclusivity. **Affordability of Offered Solutions** impacts the "**Revenue Streams**" and "**Value Propositions**" blocks. Offering affordable pricing models can make services more attractive to a broader user base. And finally, **lack of awareness** relates to the "**Channels**" and "**Customer Relationships**" blocks. Effective marketing and communication strategies are essential to raise awareness and inform potential users about the benefits and availability of shared mobility services.

4. What do you believe are the main potential business viability enablers when trying to establish an integrated and seamless shared mobility ecosystem?

The survey results in **Figure 20** indicate the main potential business viability enablers for establishing an integrated and seamless shared mobility ecosystem. **Incorporating mobility hubs with shared mobility solutions** is considered the most significant enabler, with 81.7% of experts selecting it. **Financial incentives** to avoid high costs and low short-term return on investment follows, with 70.8% support. **Corporate mobility solutions** were selected by 44.2% of experts, while **Customizable solutions for pricing scheme, and vehicle access** garnered 35% support. **Public actors often must not interfere with market competition** was chosen by 25.8% of respondents.

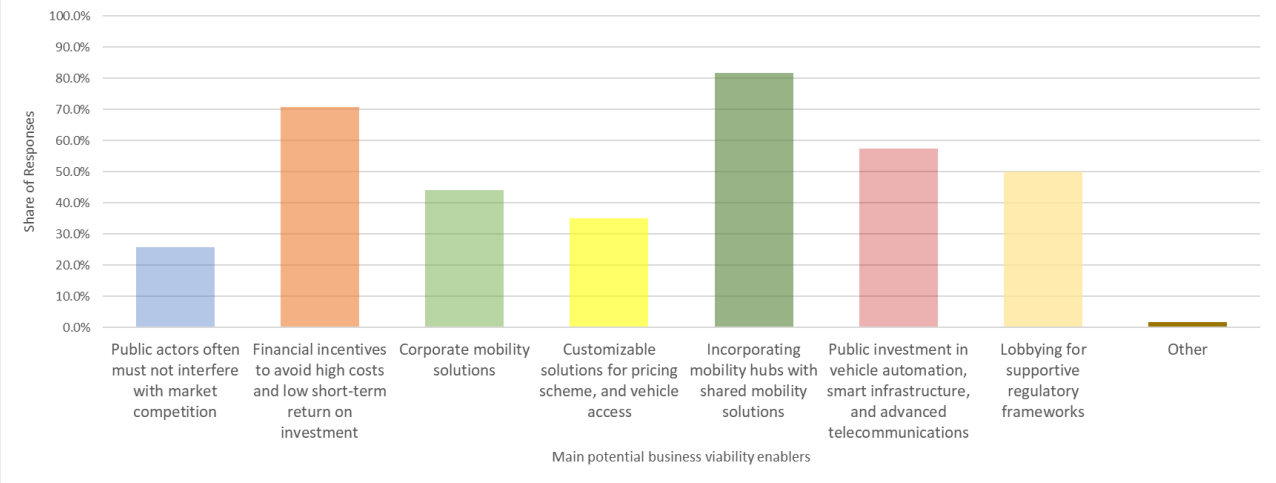

Figure 20 - Enablers: Expert Survey on main potential business viability enablers to establish an integrated and seamless shared mobility ecosystem

Discussion: In the context of the BMC, these enablers align with several key building blocks. Incorporating Mobility Hubs with Shared Mobility Solutions relates to the "**Key Activities**", "**Key Resources**" and "**Channels**" blocks. Mobility hubs serve as central points for accessing various shared mobility services, facilitating integration and user convenience. Financial Incentives to Avoid High Costs and Low Short-term Return on Investment connects to the "**Revenue Streams**" and "**Cost Structure**" blocks. Financial incentives can help offset initial costs and make the business model more attractive to investors and early adopters. Corporate Mobility Solutions impacts the "**Customer Segments**" and "**Value Propositions**" blocks. Providing tailored solutions for corporate clients can open new revenue streams and enhance the value proposition for businesses looking to offer mobility benefits to their employees.

Customizable Solutions for Pricing Scheme, and Vehicle Access relates to the "**Value Propositions**" and "**Customer Relationships**" blocks. Offering customizable pricing and vehicle access options can cater to diverse user needs and enhance customer satisfaction and loyalty. Public Actors Often Must Not Interfere with Market Competition aligns with the "**Key Partnerships**" and "**Customer Relationships**" blocks. Allowing market competition can foster innovation and improve service quality, benefiting users and providers

alike. Public Investment in Vehicle Automation, Smart Infrastructure, and Advanced Telecommunications impacts the "**Key Resources**" and "**Key Activities**" blocks. Public investment in technology and infrastructure can provide the necessary support for advanced mobility solutions, enhancing operational efficiency and user experience. Lobbying for Supportive Regulatory Frameworks connects to the "**Key Partnerships**" and "**Customer Relationships**" blocks. Effective lobbying can help create a favourable regulatory environment, facilitating smoother operations and growth for shared mobility services. Phasing Out Private Cars in Urban Environments relates to the "**Value Propositions**" and "**Customer Segments**" blocks. Reducing reliance on private cars can shift user preferences towards shared mobility solutions, creating a larger market and promoting sustainable urban transport.

5. New shared mobility services are changing the mobility landscape in our cities, yet this shift often raises significant concerns. For each type of shared mobility solution, what are the critical concerns that need to be addressed today?

The survey results in **Figure 21** indicate the critical concerns that need to be addressed for different shared mobility solutions. For the MaaS solution, "**Digital platforms and Integration with other mobility services**", is considered the most significant concern with 85% of experts selecting it. "**Regulations**" with 75 % and "**Pricing scheme**" with 73% of experts' selection are considered other critical concerns with respect to this solution. Experts suggest that the least urgent issues to address with this solution are "**safety**," "**user acceptance**" and "**competitiveness within the ecosystem**".

Critical concerns	Ridesharing	Micro-mobility	On-demand ride	DRT	Carsharing	Moped sharing	MaaS
Safety and user acceptance	75%	56%	34%	14%	34%	61%	12%
Pricing schemes	48%	46%	58%	46%	53%	33%	73%
Digital platforms and Integration with other mobility services	54%	48%	40%	43%	48%	34%	85%
Regulations (e.g., Data sharing or Subsidization)	52%	56%	54%	42%	48%	41%	75%
High operational cost	17%	31%	35%	64%	30%	24%	21%
Low revenue stream	57%	23%	28%	23%	33%	23%	28%
Suffering from a competitive ecosystem	30%	48%	20%	18%	30%	20%	13%

Figure 21 - Shared mobility solutions: Expert Survey on critical concerns that needs to be addressed

6. Which key activities today remain underdeveloped for achieving a viable business ecosystem of integrated shared mobility and public transport services?

The discussion on the key activities that remain underdeveloped for achieving a viable business ecosystem of integrated shared mobility and PT services is already covered in **Section 4.2.2 Key Activities**. In summary, this section identifies fleet management, marketing, and IT platform development as critical activities. While fleet management and IT platform development are well-developed, marketing needs more attention. Additionally, data provision and analytics, customer support, and quality control are underdeveloped and require significant focus for a seamless and integrated mobility ecosystem.

Table 3 Status of development of Key activities for achieving a viable business ecosystem

Key activities	Underdeveloped	Moderately developed	Most developed
IT platform and API development	16.7%	62.5%	12.5%
Dynamic and real-time information provision	21.7%	56.7%	16.7%
Trip planning, booking, and scheduling	7.5%	46.7%	42.5%
Ticketing and payment	21.7%	44.2%	30.0%
Routing and fleet management	16.7%	35.8%	42.5%
Data provision and analytics	32.5%	50.8%	11.7%
Customer support and quality control	36.7%	45.8%	11.7%
Marketing	10.8%	48.3%	29.2%

7. How important and effective it is to involve the following stakeholders to implement viable seamless shared urban mobility business operations?

The discussion on the importance and effectiveness of involving stakeholders in implementing viable seamless shared urban mobility business operations is covered in **Section 4.2.1 Key Partners and Suppliers**. In brief, strategic partnerships with local governments, PTOs, infrastructure providers, OEMs, and private transport operators are crucial. Local governments provide infrastructure and subsidies, while other partners enhance service integration and support vehicle investments and operations. Experts highlight the importance of mobility service providers, user groups, governmental bodies, and infrastructure providers, indicating a shared recognition of the need for comprehensive collaboration to achieve seamless urban mobility solutions.

8. In a seamless shared urban mobility ecosystem with many stakeholders/actors involved, which type of organization should lead the coordination?

The survey results indicate a strong preference for city or regional public transportation authorities to lead the coordination of a seamless shared urban mobility ecosystem, with 71.7% of respondents favouring this option (**Figure 22**). This suggests a significant confidence in the capability of these authorities to oversee and integrate various mobility services effectively. Municipal and local authorities also received substantial support at 58.3%, indicating a preference for local governance in managing urban mobility. PTOs are seen as leaders by 15.8% of respondents, reflecting a role for traditional transit providers in new mobility paradigms.

Conversely, a consortium of companies that provide integrated mobility services, while a logical choice, was favoured by only 14.2% of respondents, perhaps reflecting concerns about the complexities of private-sector coordination across competitive lines. MaaS providers and operators of Intelligent Transportation Systems (ITS) received relatively lower confidence, at 13.3% and 1.7% respectively, indicating potential hesitations about the efficacy or readiness of these entities to lead at scale.

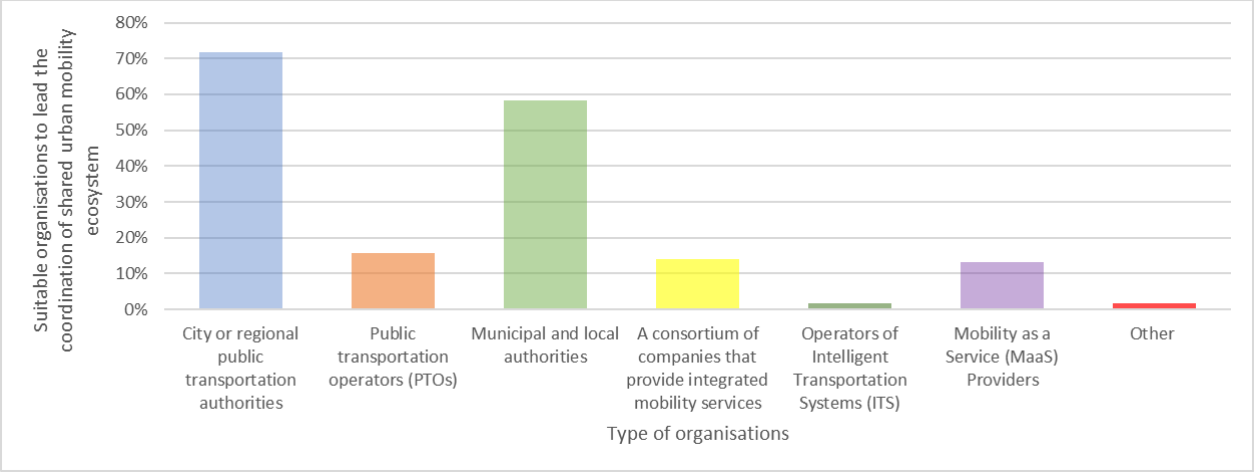

Figure 22 - Coordination and Control: Expert Survey on type of organization that should lead the coordination seamless shared urban mobility business

Discussion: The choice for City or Regional Public Transportation Authorities correlates with the "**Key Partnerships**" "**Key Activities**" and "**Customer Relationships**" blocks of the Business Model Canvas. These authorities are well-positioned to manage key partnerships across various stakeholders, including government bodies and private enterprises, centralize critical activities like policy setting and infrastructure management, and maintain robust customer relationships through reliable and accessible public service. Furthermore, about Municipal and Local Authorities, their local insights and direct interactions with community members allow them to tailor mobility solutions to specific demographic needs and preferences, enhancing user engagement and satisfaction.

9. To what extent would the following cost factors burden operators who might participate in integrated and seamless shared mobility solutions?

The expert survey data on cost factors within the shared urban mobility ecosystem emphasizes the significant financial priorities and challenges faced by the industry. Key areas such as infrastructure maintenance, fleet acquisition, and fleet maintenance are highlighted as primary expenses, with a considerable proportion of respondents marking these as highly critical. For a detailed discussion on these aspects and their implications on the business model, refer to **Section 4.3.1 Cost Structure** in the report.

10. How would you rate the effectiveness of the following push and pull measures in achieving seamless shared urban mobility business operation?

The survey data on the effectiveness of various push and pull measures for achieving seamless shared urban mobility reveals notable preferences and perceptions among experts (**Figure 23**). Among the push measures, **reducing parking availability** in urban areas is considered the most effective, with a significant 65.8% of respondents rating it as highly effective. This indicates a strong consensus on the impact of limiting parking to encourage the use of alternative transportation modes. Implementing congestion charges in city centers also received substantial support, with 58.3% rating it as highly effective. For the pull measures, **improving pedestrian infrastructure** to encourage walking shares the highest effectiveness rating at 65.8%, highlighting its perceived importance in creating a pedestrian-friendly urban environment. Enhancing the quality and coverage of **first and last mile shared mobility services** is also seen as highly effective by 51.7% of respondents, emphasizing the critical role of connecting core transit services to mobility hubs, and other activities. Conversely, **promoting the use of electric and low-emission vehicles** through incentives is viewed as less effective, with the highest non-effectiveness rate of 22.5% and only 16.7% considering it highly effective.

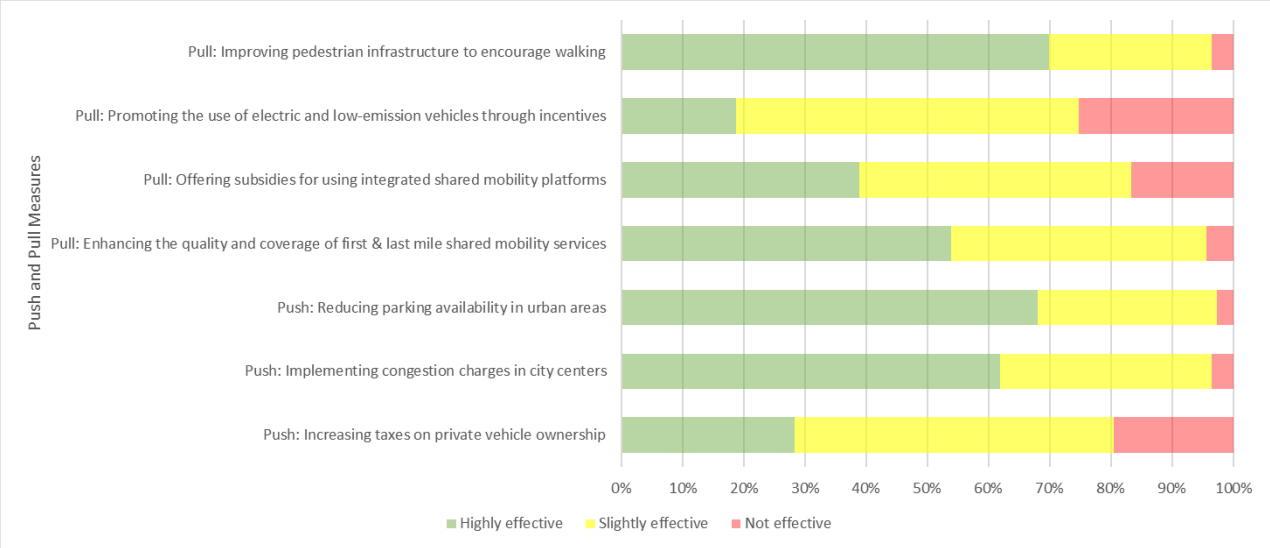

Figure 23 - Control: Expert Survey on Push and Pull measures for achieving seamless shared urban mobility

The expert's opinion regarding the effectiveness of promoting the use of electric and low-emission vehicles through incentives as a Pull measure might indicate scepticism about the sufficiency of such incentives alone to drive significant shifts toward low-emission vehicle usage without accompanying structural changes. Accordingly, if the pull factors (e.g. such as improving pedestrian infrastructure, and enhancing the quality and coverage of first and last mile shared mobility services while promoting the use of electric and low-emission) of shared mobility is complemented with push policies, such as reducing parking availability and implementing congestion charge to remove private cars from city centers, shared mobility would likely translate into both improved accessibility and lower total emissions.

11. What criteria should be used to determine the success of a seamless integrated shared mobility business operation, especially for mobility platform providers (e.g. MaaS Bundles)?

The survey results on determining the success criteria for seamless integrated shared mobility operations (**Figure 24**), particularly for mobility platform providers such as MaaS bundles, reveal varied priorities among experts. **A business case profitable for the society (i.e. through co-creation)** received the highest value as most important (65%), with a significant focus also on it being very important (16.7%). This emphasizes a strong belief in the social impact and community benefits as a primary indicator of success, suggesting that societal value creation through co-creative approaches is important and necessary. The **Profitability for Mobility Service Providers** is also highly prioritized, with 40% of respondents rating it as most important and 35% as very important, indicating a strong consensus that profitability remains a fundamental measure of success. This may align with the business's sustainability and ability to continue providing services.

On the other hand, the experts view on **Profitability for MaaS Service Providers** show that while profitability through digital platforms is critical, it is part of a broader set of success factors (only 9.2% consider it the most important criterion). Also, the **Revenue from Vehicle Automation and Electrification** receives a more cautious assessment, with the majority (45.8%) considering it moderately important. The results indicate that vehicle automation and electrification are recognized for their potential but are not the foremost factor in determining overall business success at this stage. Finally, **Increased Revenue from Digital Tools** while significant, shows a spread across the importance scale with 38.3% considering it moderately important and 30.8% as very important, but only 12.5% see it as most important. This suggests that while digital tools are essential for revenue generation, they may not seen as the primary driver of success of the business.

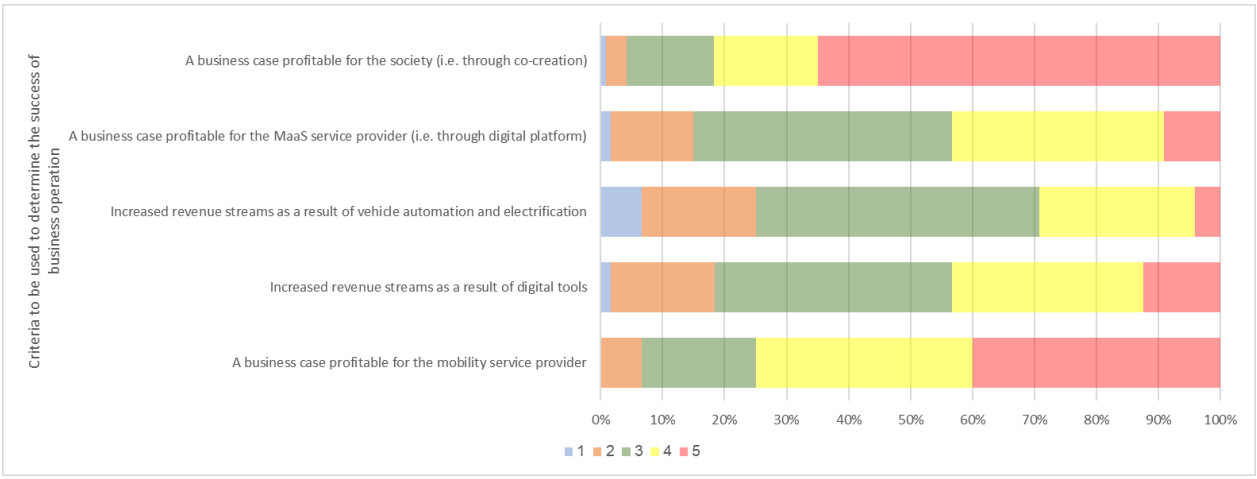

Figure 24 - Viability: Expert Survey on criteria to determine the success of a seamless integrated shared mobility business operation (MaaS)

* The ranks are in order of importance (1-least important to 5-most important).

12. Which performance indicators would you consider to assess the success of integrated and seamless shared urban mobility business operation?

The analysis of performance indicators for assessing the success of integrated and seamless shared urban mobility business operations reveals a diverse range of metrics emphasized by experts, as reflected in **Figure 25**. Among these, **Usage-Frequency** emerges as the most emphasized indicator with 23 mentions, underscoring its critical role in measuring service adoption and effectiveness. Reduction of Congestion and Modal Shift follow with 15 and 13 mentions respectively, highlighting their importance in achieving the goals of reducing urban traffic and encouraging the shift from private vehicle use to shared mobility options. Reliability and Travel Time are also prioritized with 11 and 8 mentions, indicating the value placed on dependable and efficient services for user satisfaction.

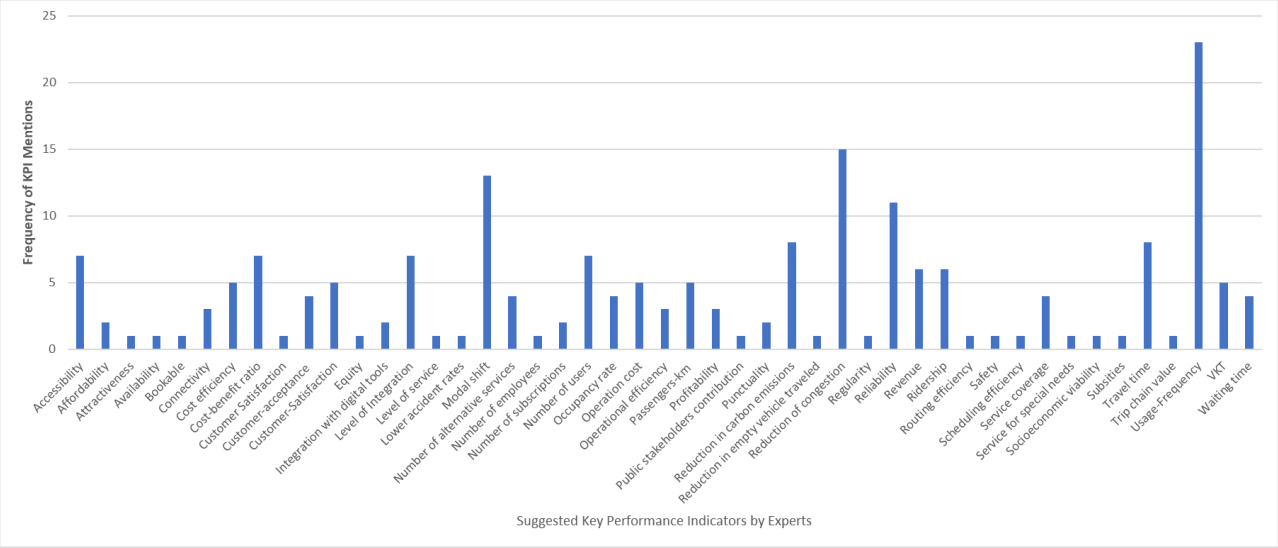

Figure 25 – Key Performance Indicators: Expert Survey on main measures to assess the success of integrated and seamless shared urban mobility business operation

Additionally, a word cloud visualization is also used to present these indicators (**Figure 26**).

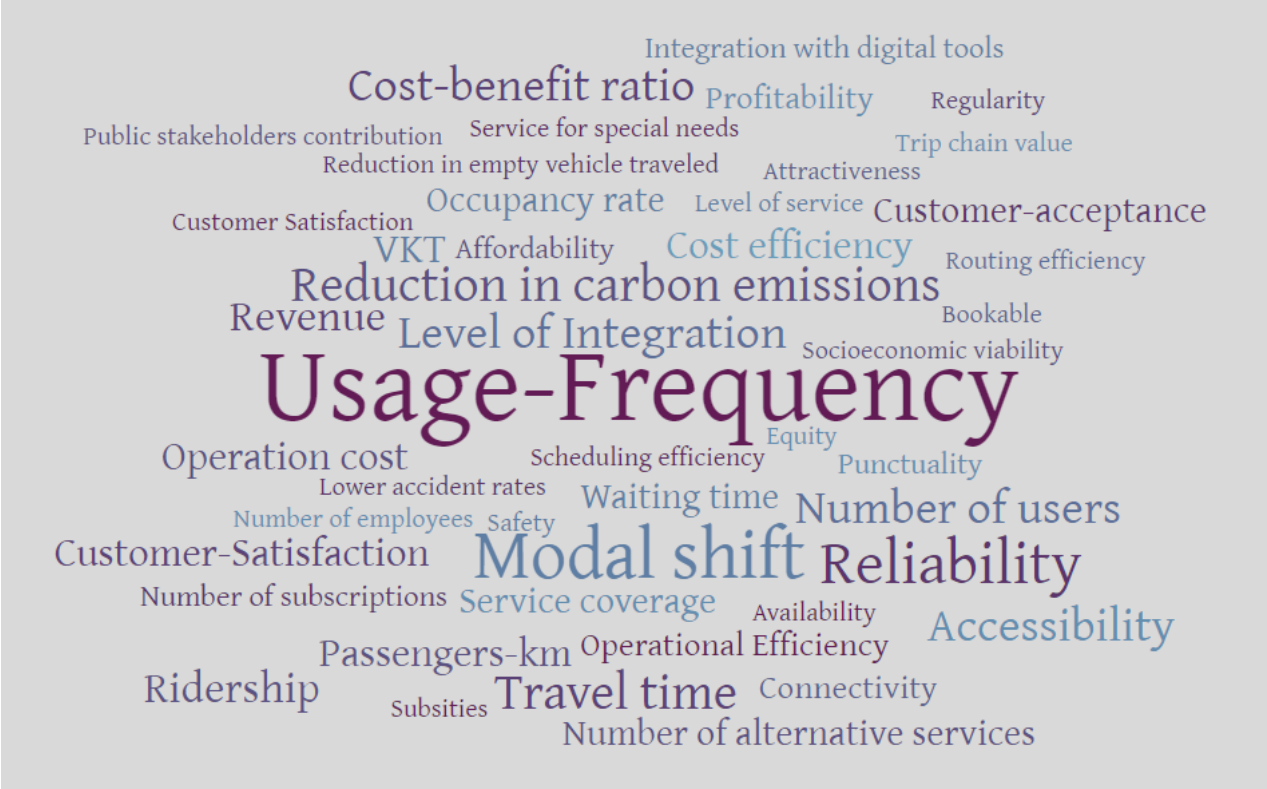

Figure 26 - Word Cloud of Performance Indicators defined by experts

6 Conclusions

The findings from the literature review on best practices and expert survey underscore the essential shift towards ecosystemic business structures in the urban mobility sector. Traditional business models are being redefined to accommodate complex interdependencies between diverse public and private entities, aiming for a holistic value proposition that benefits all stakeholders involved. The framework utilized in WP5.3 evaluates these new business models across three dimensions: value proposition, value creation and delivery, and value capture, detailed within the nine building blocks of the BMC. This structured approach helps in understanding how interconnected activities within the seamless mobility ecosystem can collectively lead to a viable business ecosystem evaluation framework. The ongoing analysis and evaluations conducted within the project will continue to refine these models, ensuring they are equipped to meet the challenges of today's dynamic shared mobility demands. By embracing this ecosystemic approach, WP5.3 aims to establish a robust foundation for the sustainable integration of shared mobility solutions into the urban transport landscape, characterized by innovative collaborations and enhanced governance mechanisms.

Key Insights from the Business Model Analysis:

- The principal value proposition is the type of sharing. Furthermore, the shared mobility services highlight diverse value propositions with emphasis on innovations in service personalization, expanding mobility in underserved areas, enhancing service area coverage, and integrating services through comprehensive apps that support routing, booking, and payments.

- Strong customer relationships are fostered through efficient customer services and integration. The main customer segments include urban residents without personal vehicles, emphasizing the need for shared mobility services that cater to specific local demographics and mobility requirements.
- The study underscores the importance of strategic partnerships, particularly with local governments and PTOs, which facilitate infrastructure support and seamless service integration.
- Key activities such as fleet management and marketing are crucial, with technological platforms serving as essential enablers of efficient service delivery.
- Resources critical for service delivery include a well-managed vehicle fleet, robust IT platforms for user interaction, and adequate transport infrastructure like dedicated parking spots, highlighting the importance of physical and digital infrastructure in shared mobility.
- Effective distribution and communication channels, primarily digital platforms, are vital for reaching out to and engaging with customers, reflecting the digitization trends in modern mobility solutions.

Key Insights from the Expert Survey Analysis:

- The most effective structural approaches to transform the current management of an integrated and seamless shared urban mobility ecosystem into viable market realities are through regional governance initiatives that had the highest support followed by top-down governance driving initiatives and Multi-local market initiatives.
- Experts reiterate the importance of involving a wide range of stakeholders, including mobility service providers, user groups, governmental bodies, and infrastructure providers. This broad engagement is essential for creating a viable, seamless shared urban mobility business ecosystem.
- The main potential barriers that might deter the willingness of users to accept or use the offered solutions are related to insufficient incentive and limited-service coverage
- For the MaaS solution, digital platforms and Integration with other mobility services are considered the most significant concern that needs to be addressed today.
- There is a strong preference among experts for city or regional public transportation authorities to lead the coordination of a seamless shared urban mobility ecosystem. This suggests a significant confidence in the capability of these authorities to oversee and integrate various mobility services effectively.
- Incorporating mobility hubs with shared mobility solutions is considered the most significant business viability enabler when trying to establish an integrated and seamless shared mobility ecosystem
- Underdeveloped Key Activities: While some areas such as fleet management and IT platform development are well-developed, marketing, customer support, and quality control need more focus to enhance service delivery and customer satisfaction.
- Reducing parking availability in urban areas is considered the most effective push measure to encourage the use of alternative transportation modes.
- Improving pedestrian infrastructure and enhancing the quality and coverage of first and last-mile shared mobility services are considered the most effective pull measures in achieving seamless shared urban mobility business operation.
- Operational costs, particularly those associated with fleet maintenance and technology platforms, constitute significant financial burdens on operators. Revenue streams are diversified, with a mix of user fees, subscriptions, and substantial government subsidies indicating reliance on public funding to supplement direct earnings.

7 Future work

Future work on this topic will focus on further refining and testing the business models developed under Project SUM to ensure their adaptability in dynamic urban environments. This will involve:

1. Incorporate additional layers into ecosystemic business structure that includes a sustainability-oriented business model reflection of viability principles into the local business ecosystem.
2. Validate the proposed ecosystemic business models by conducting one to one interview with each Living lab; determining local circumstances of each lab, business assumptions, challenges, short term and long-term business goals, and regulatory constraints
3. Iteratively improve the models based on real-world feedback and emerging trends within each living lab.
4. Enhance the control and governance mechanisms and stakeholder engagement strategies to ensure that all parties are aligned and motivated towards the shared goals of sustainability and efficiency in shared mobility solutions.

The next deliverable, D5.4, will focus on initial versions of validated business models per living lab and Deliverable D5.5 will finalise the validated business models and ensure the transferability of developed business models under the ecosystemic business structure evaluation framework.

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Annex 1: Business model structure: Service -level

This section outlines the findings from our best practice analysis of different shared mobility services, including Bike-sharing, Car-sharing, MaaS, Motorcycle sharing, On-demand ride services, Ride-sharing, and Scooter-sharing. It details out the analysis results under each building blocks including Key partners (**Table 3**), Key activities (**Table 4**), Key resources (**Table 5**), Value proposition based on products and suppliers (**Table 6**), Customer Structure Relationship (**Table 7**), Customer Segment (**Table 8**), Customer Channels (**Table 9**), Cost Structure (**Table 10**) and Revenue Streams (**Table 11**).

Table 4 Business model canvas Key Partners content per mode

	Bike-sharing	Car-sharing	Maas	Motocycle sharing	On-demand ride service	Ride-sharing	Scooter-sharing
IT infrastructure providers	0%	0%	0%	0%	3%	0%	0%
Local government	14%	11%	11%	3%	3%	6%	3%
Payment operators	0%	3%	0%	0%	0%	3%	3%
Private transport operators	0%	0%	3%	0%	0%	0%	0%
Public transport operators	0%	3%	3%	0%	0%	0%	0%
Transport infrastructure providers	3%	0%	0%	0%	0%	0%	0%

Table 5 Business model canvas Key Activities content per mode

	Bike-sharing	Car-sharing	Maas	Motocycle sharing	On-demand ride service	Ride-sharing	Scooter-sharing
Booking	0%	11%	11%	0%	0%	6%	0%
Customer support	3%	3%	0%	0%	0%	0%	0%
Fleet management	11%	14%	3%	3%	3%	0%	6%
IT platform development	0%	0%	0%	0%	0%	3%	0%
Marketing	6%	0%	3%	0%	0%	0%	0%
Routing	0%	0%	0%	0%	3%	0%	0%

Table 6 Business model canvas Key Resources content per mode

	Bike-sharing	Car-sharing	Maas	Motocycle sharing	On-demand ride service	Ride-sharing	Scooter-sharing
API	3%	0%	0%	0%	0%	0%	0%
Human resources	0%	0%	8%	0%	0%	0%	0%
Technological platform	0%	8%	0%	0%	3%	6%	0%
Transport infrastructure	3%	3%	0%	0%	3%	0%	0%
User & driver apps	3%	0%	0%	0%	0%	0%	0%
Vehicles	11%	17%	8%	3%	0%	3%	6%

Table 7 Business model canvas Value Proposition content per mode

	Bike-sharing	Car-sharing	Maas	Motocycle sharing	On-demand ride service	Ride-sharing	Scooter-sharing
Personalisation	0%	0%	3%	0%	0%	0%	0%
Service area	0%	0%	0%	0%	6%	0%	0%
Service integration	8%	6%	0%	0%	0%	3%	6%
Transport mode integration	3%	0%	0%	0%	0%	0%	0%
Type of sharing	6%	19%	14%	3%	0%	6%	0%

Table 8 Business model canvas Customer Structure Relationship content per mode

	Bikesharing	Carsharing	Maas	Ridesharing	Scooter sharing
Customer integration	3%	0%	0%	0%	0%
Customer retention	0%	3%	0%	0%	0%
Customer service	6%	3%	8%	6%	6%

Table 9 Business model canvas Customer Segment content per mode

	Bike-sharing	Car-sharing	Maas	On-demand ride service	Ride-sharing	Scooter sharing
Customer modality style	0%	3%	0%	0%	0%	0%
Customer type	11%	11%	11%	3%	6%	6%
Spatial dimension	0%	0%	0%	3%	0%	0%
Trip purpose	3%	0%	0%	0%	3%	0%

Table 10 Business model canvas Customer Channels content per mode

	Bikesharing	Carsharing	Maas	Ridesharing	Scooter sharing
Communication channels	8%	8%	8%	0%	0%
Distribution channels	0%	8%	0%	6%	6%

Table 11 Business model canvas Cost Structure content per mode

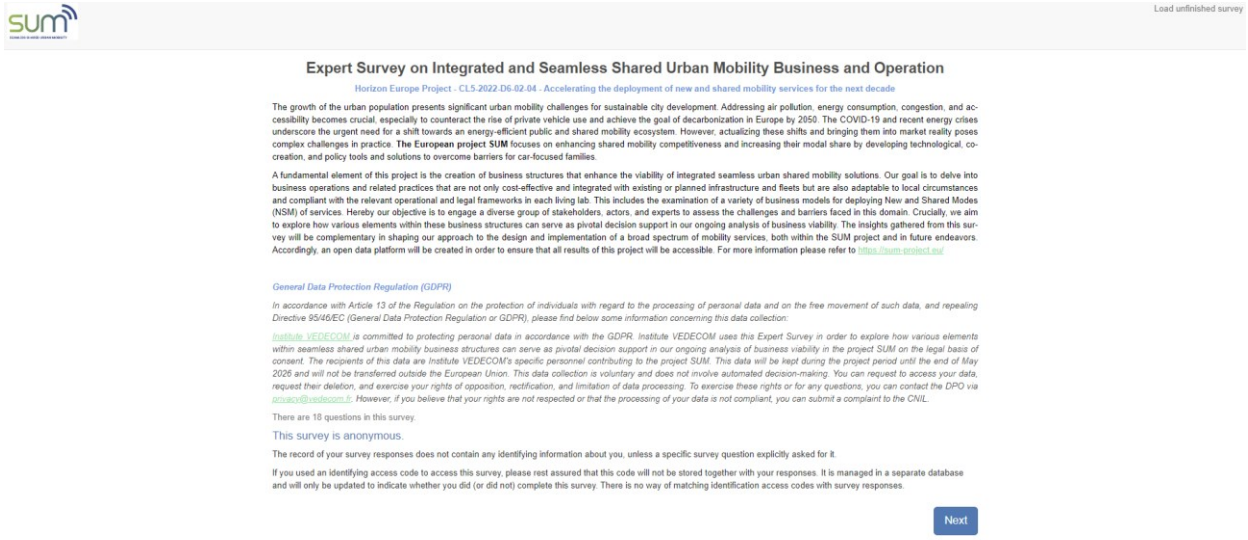
	Bike-sharing	Car-sharing	Maas	On-demand ride service	Ride-sharing	Scooter sharing
Investment costs	8%	6%	0%	0%	0%	6%
Operational costs	6%	0%	6%	3%	3%	0%
Policy instruments	3%	0%	0%	0%	0%	0%

Table 12 Business model canvas Revenue Strems content per mode

	Bikesharing	Carsharing	Maas	On-demand ride service	Ridesharing	Scooter sharing
Fares	11%	8%	8%	6%	3%	3%
Service fees	6%	11%	3%	0%	3%	3%

Annex 2. Online Expert Survey Template

Annex 2 represents the developed online expert survey.



Load unfinished survey

Expert Survey on Integrated and Seamless Shared Urban Mobility Business and Operation

Horizon Europe Project - CL5-2022-D6-02-04 - Accelerating the deployment of new and shared mobility services for the next decade

The growth of the urban population presents significant urban mobility challenges for sustainable city development. Addressing air pollution, energy consumption, congestion, and accessibility becomes crucial, especially to counteract the rise of private vehicle use and achieve the goal of decarbonization in Europe by 2050. The COVID-19 and recent energy crises underscore the urgent need for a shift towards an energy-efficient public and shared mobility ecosystem. However, actualizing these shifts and bringing them into market reality poses complex challenges in practice. **The European project SUM** focuses on enhancing shared mobility competitiveness and increasing their modal share by developing technological, co-creation, and policy tools and solutions to overcome barriers for car-focused families.

A fundamental element of this project is the creation of business structures that enhance the viability of integrated seamless urban shared mobility solutions. Our goal is to delve into business operations and related practices that are not only cost-effective and integrated with existing or planned infrastructure and fleets but are also adaptable to local circumstances and compliant with the relevant operational and legal frameworks in each living lab. This includes the examination of a variety of business models for deploying New and Shared Modes (NSM) of services. Hereby our objective is to engage a diverse group of stakeholders, actors, and experts to assess the challenges and barriers faced in this domain. Crucially, we aim to explore how various elements within these business structures can serve as pivotal decision support in our ongoing analysis of business viability. The insights gathered from this survey will be complementary in shaping our approach to the design and implementation of a broad spectrum of mobility services, both within the SUM project and in future endeavors. Accordingly, an open data platform will be created in order to ensure that all results of this project will be accessible. For more information please refer to https://sum-project.eu/

General Data Protection Regulation (GDPR)

In accordance with Article 13 of the Regulation on the protection of individuals with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation or GDPR), please find below some information concerning this data collection:

Institute VEDECOM is committed to protecting personal data in accordance with the GDPR. Institute VEDECOM uses this Expert Survey in order to explore how various elements within seamless shared urban mobility business structures can serve as pivotal decision support in our ongoing analysis of business viability in the project SUM on the legal basis of consent. The recipients of this data are Institute VEDECOM's specific personnel contributing to the project SUM. This data will be kept during the project period until the end of May 2026 and will not be transferred outside the European Union. This data collection is voluntary and does not involve automated decision-making. You can request to access your data, request their deletion, and exercise your rights of opposition, rectification, and limitation of data processing. To exercise these rights or for any questions, you can contact the DPO via privacy@vedecom.fr. However, if you believe that your rights are not respected or that the processing of your data is not compliant, you can submit a complaint to the CNIL.

There are 18 questions in this survey.

This survey is anonymous.

The record of your survey responses does not contain any identifying information about you, unless a specific survey question explicitly asked for it.

If you used an identifying access code to access this survey, please rest assured that this code will not be stored together with your responses. It is managed in a separate database and will only be updated to indicate whether you did (or did not) complete this survey. There is no way of matching identification access codes with survey responses.

Next

Please indicate the type of organization you are currently affiliated with.

- Public Transportation Operator (PTO)
- Non-Public Transportation Operator (Non-PTO)
- Government or Regulatory Agency
- Private Sector Mobility Provider (e.g., Technology, Ticketing, Data, etc.)
- Non-Profit or Advocacy Group
- Academic or Research Institutions
- Manufacturers (e.g., OEMs)
- Public Transportation Association (PTA)
- Public Sector Mobility Provider (e.g., Technology, Ticketing, Data, etc.)
- No answer
- Other
- No answer

For which European country or city will the information and insights provided in this survey be most relevant?

1. **Considering the structure of current urban mobility business operations and different business models of urban mobility providers in your city, how can the management of an integrated and seamless shared urban mobility ecosystem be structured to facilitate its emergence into a market reality?**

*Considering the structure of current urban mobility business operations and different business models of urban mobility providers in your city, how can the management of an integrated and seamless shared urban mobility ecosystem be structured to facilitate its emergence into a market reality?

Check all that apply. You can add comments per answer if needed.

Comment only when you choose an answer.

- ☐ Through Multi-local market initiatives (i.e., including local entities focusing on local actors, needs, and conditions)
- ☐ Through global stakeholder community initiatives (i.e., including multi-national entities focusing on global actors)
- ☐ Through integrated mobility start-up community and transport authority initiatives
- ☐ Through top-down governance driving initiatives (i.e., considering the multidimensional role of the public sector)
- ☐ Through regional governance initiatives (i.e., bringing various municipalities together under one organizing body and designing and funding projects and infrastructure through a single municipal planning organization)
- Other:

2. From the viewpoint of a shared urban mobility service provider, what do you believe are the main potential challenges in integrating shared mobility into the existing infrastructure to achieve a seamless ecosystem?

*From the viewpoint of a shared urban mobility service provider, what do you believe are the main potential challenges in integrating shared mobility into the existing infrastructure to achieve a seamless ecosystem?

Please rank the following in order of importance (1-least important to 5-most important).

	1	2	3	4	5
Business (e.g., lack of viable business models or high market competition)	○	○	○	○	○
Economical and Financial (e.g., operational cost)	○	○	○	○	○
Technological and Technical (e.g., software/hardware compatibility)	○	○	○	○	○
Regulatory and Legal (e.g., data sharing, (local) policies, taxation laws)	○	○	○	○	○
Organizational (e.g., coordination within and between organizations)	○	○	○	○	○
Topological (e.g., service coverage and access to offered services)	○	○	○	○	○
User acceptance	○	○	○	○	○
Social acceptance and community	○	○	○	○	○

3. From the viewpoint of the shared mobility service users, what do you believe are the main potential barriers that might deter their willingness to accept or use the offered solutions?

*From the viewpoint of the shared mobility service users, what do you believe are the main potential barriers that might deter their willingness to accept or use the offered solutions?

Please rank the following in order of importance (1-least important to 5-most important).

	1	2	3	4	5
Safety and Trust	○	○	○	○	○
Desire to travel alone (i.e., not willing to share)	○	○	○	○	○
Insufficient incentives for private vehicle owners to shift	○	○	○	○	○
Limited service coverage	○	○	○	○	○
Ticketing and payment difficulties	○	○	○	○	○
Accessibility issues	○	○	○	○	○
Affordability of offered solutions	○	○	○	○	○
Lack of awareness	○	○	○	○	○

4. **What do you believe are the main potential business viability enablers when trying to establish an integrated and seamless shared mobility ecosystem?**

*What do you believe are the main potential business viability enablers when trying to establish an integrated and seamless shared mobility ecosystem?

Check all that apply

- ☐ Public actors often must not interfere with market competition
- ☐ Financial incentives to avoid high costs and low short-term return on investment
- ☐ Corporate mobility solutions
- ☐ Customizable solutions for pricing scheme, and vehicle access
- ☐ Incorporating mobility hubs with shared mobility solutions
- ☐ Public investment in vehicle automation, smart infrastructure, and advanced telecommunications
- ☐ Lobbying for supportive regulatory frameworks
- ☐ Other:

Integration of Shared Mobility Solutions with Existing Services

5. **New shared mobility services are changing the mobility landscape in our cities, yet this shift often raises significant concerns. For each type of shared mobility solution, what are the critical concerns that need to be addressed today?**

*New shared mobility services are changing the mobility landscape in our cities, yet this shift often raises significant concerns. For each type of shared mobility solution, what are the critical concerns that need to be addressed today?

	Ridesharing (e.g., carpooling)	Micro-mobility sharing (e.g., (e)Scooter, (e)Bike, (e)cargo bike)	On-demand ride services (e.g, e-hailing)	Demand-responsive transit (DRT)	Carsharing	Moped sharing	Mobility as a Service (MaaS)	No answer
Safety and user acceptance	☐	☐	☐	☐	☐	☐	☐	☐
Pricing schemes	☐	☐	☐	☐	☐	☐	☐	☐
Digital platforms and Integration with other mobility services	☐	☐	☐	☐	☐	☐	☐	☐
Regulations (e.g., Data sharing or Subsidization)	☐	☐	☐	☐	☐	☐	☐	☐
High operational cost	☐	☐	☐	☐	☐	☐	☐	☐
Low revenue stream	☐	☐	☐	☐	☐	☐	☐	☐
Suffering from a competitive ecosystem	☐	☐	☐	☐	☐	☐	☐	☐

6. Which key activities today remain underdeveloped for achieving a viable business ecosystem of integrated shared mobility and public transport services?

*Which key activities today remain underdeveloped for achieving a viable business ecosystem of integrated shared mobility and public transport services?

	Underdeveloped	Moderately developed	Most developed	Uncertain
IT platform and API development	○	○	○	○
Dynamic and real-time information provision	○	○	○	○
Trip planning, booking, and scheduling	○	○	○	○
Ticketing and payment	○	○	○	○
Routing and fleet management	○	○	○	○
Data provision and analytics	○	○	○	○
Customer support and quality control	○	○	○	○
Marketing	○	○	○	○

Stakeholders

7. How important and effective it is to involve the following stakeholders to implement viable seamless shared urban mobility business operations?

*How important and effective it is to involve the following stakeholders to implement viable seamless shared urban mobility business operations?

Please rank the following in order of importance (1-least important to 5-most important).

	1	2	3	4	5
Mobility service providers	○	○	○	○	○
Infrastructure providers (e.g., payment operators, charging station providers)	○	○	○	○	○
Companies that supply vehicles (e.g., micro-mobility rental companies)	○	○	○	○	○
Software-based service providers (e.g., MaaS platform providers, IT platform providers)	○	○	○	○	○
Public transport associations	○	○	○	○	○
Governmental and regulatory bodies	○	○	○	○	○
User groups	○	○	○	○	○
Manufacturers (e.g., original equipment manufacturers (OEMs))	○	○	○	○	○
Data providers (e.g., organizations that supply necessary data)	○	○	○	○	○
Financial intermediaries (e.g., banks, insurance, public funding)	○	○	○	○	○

8. In a seamless shared urban mobility ecosystem with many stakeholders/actors involved, which type of organization should lead the coordination?

*In a seamless shared urban mobility ecosystem with many stakeholders/actors involved, which type of organization should lead the coordination?

Please select at most 2 answers

- ☐ City or regional public transportation authorities
- ☐ Public transportation operators (PTOs)
- ☐ Municipal and local authorities
- ☐ A consortium of companies that provide integrated mobility services
- ☐ Operators of Intelligent Transportation Systems (ITS)
- ☐ Mobility as a Service (MaaS) Providers
- ☐ Other:

9. To what extent would the following cost factors burden operators who might participate in integrated and seamless shared mobility solutions?

*To what extent would the following cost factors burden operators who might participate in integrated and seamless shared mobility solutions?

Please rank the following in order of importance (1-least important to 5-most important).

	1	2	3	4	5
Infrastructure maintenance (e.g., expenses related to station repairs, road maintenance, charging station, etc.)	○	○	○	○	○
Fleet acquisition and IT hardware, software development and purchase	○	○	○	○	○
Fleet maintenance	○	○	○	○	○
Software maintenance (e.g., expenses related to platform updates)	○	○	○	○	○
Staff support (e.g., expenses related to drivers, engineers, monitoring, etc.)	○	○	○	○	○
Insurance and legal-related costs	○	○	○	○	○
Taxation (e.g., business and consumption taxes)	○	○	○	○	○
Customer support and marketing costs	○	○	○	○	○
Data treatment and integration costs	○	○	○	○	○

10. How would you rate the effectiveness of the following push and pull measures in achieving seamless shared urban mobility business operation?

*How would you rate the effectiveness of the following push and pull measures in achieving seamless shared urban mobility business operation?

	Highly effective	Slightly effective	Not effective	Uncertain
Push: Increasing taxes on private vehicle ownership	○	○	○	○
Push: Implementing congestion charges in city centers	○	○	○	○
Push: Reducing parking availability in urban areas	○	○	○	○
Pull: Enhancing the quality and coverage of first & last mile shared mobility services	○	○	○	○
Pull: Offering subsidies for using integrated shared mobility platforms	○	○	○	○
Pull: Promoting the use of electric and low-emission vehicles through incentives	○	○	○	○
Pull: Improving pedestrian infrastructure to encourage walking	○	○	○	○

11. What criteria should be used to determine the success of a seamless integrated shared mobility business operation, especially for mobility platform providers (e.g. MaaS Bundles)?

*What criteria should be used to determine the success of a seamless integrated shared mobility business operation, especially for mobility platform providers (e.g. MaaS Bundles)?

Please rank the following in order of importance (1-least important to 5-most important).

	1	2	3	4	5
A business case profitable for the mobility service provider	○	○	○	○	○
Increased revenue streams as a result of digital tools	○	○	○	○	○
Increased revenue streams as a result of vehicle automation and electrification	○	○	○	○	○
A business case profitable for the MaaS service provider (i.e. through digital platform)	○	○	○	○	○
A business case profitable for the society (i.e. through co-creation)	○	○	○	○	○