European Master in Business Studies

Master Thesis Exposé

Smart Mobility services: a quantitative study of the drivers of citizens' intention to use

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List of Abbreviations

e.g.	exempli gratia
BI	Behavioral Intention
ICT	Information and Communication Technology
ITS	Intelligent Traffic System
MaaS	Mobility as a Service
ODSM	On-Demand Smart Mobility
SC	Smart City
SM	Smart Mobility
UTAUT	Unified Theory of Acceptance and Use of Technology

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Abstract

Background

Since the past decade, a growing number of cities worldwide is shifting to the new paradigm of Smart City to address the new social, environmental, economic and political challenges. Though, innovation and technology are revolutionising the majority of urban services and infrastructures. The mobility sector has been recently in the heart of the digital transformation, developing Smart Mobility solutions going from alternative means of transport to intelligent traffic control systems. The main aim is to improve citizens' quality of life and, to be successful, Smart Cities should pivot around citizens' interests. As a consequence, understanding citizens' adoption mechanism is crucial, ensuring the predictability of the use of Smart Mobility services.

Aim

The study aims at exploring the drivers of citizens' acceptance of On-demand Smart Mobility services and inquiring into their cause-effect relationships, proposing a quantitative research framework, to answer the following research question: how do drivers affect the citizens' intention to use Smart Mobility services?

Methodology

To test the hypotheses, this study applies a quantitative research approach. Citizens from urban areas in Europe are going to be surveyed, though an online-based survey.

Contributions

The study contributes to the academic literature, focusing on consumer behavior towards Smart Mobility applications, and also provides practical contributions to both public and private companies intended to implement Smart Mobility initiatives.

Keywords

Smart City, Smart Mobility, behavioral intention, UTAUT, ICT, environmental concern

1. Introduction

1.1 Background

Nowadays, the growing trend of the world urban population – from 50 to 68 percent by 2050 (UN DESA, 2019) – is expected to worsen the negative impact of cities on environment and society, averagely consuming more resources.

Indeed, according to the World Bank, global waste production will increase from 2.01 billion to 3.40 billion tonnes by 2050, with high-income countries generating the majority of it and mostly not in an environmental way. Moreover, cities are accounted as a key contributor to climate change, being accountable for the 75 percent of global CO2 emissions (European Commission, 2019). And, the UN Habitat (2019) reports that they dissipate about the 78 per cent of the world's energy.

This situation has to face the relevance that sustainability and sustainable development have reached for nations and organisations worldwide, developing countless programs and agreements to encourage a change (Bifulco et al., 2016), such as the 2030 Agenda for Sustainable Development, including several efforts to shape a new framework of urban development.

Indeed, cities are called to face new challenges, requiring policies and initiatives to manage them successfully (Albino et al., 2015; Chen, 2016; Benevolo et al., 2016): housing, transportation, energy system, broadly infrastructures and services are changing fastly.

Though, more and more leaders are planning to adapt their cities to this new trend, transforming them in *Smart Cities* (Yeh, 2017; Manfreda et al., 2019; Habib et al., 2020), as a strategy to increase citizens' quality of life, reduced environmental footprint, new economic development opportunities, efficient public utilities, safer communities, enhanced citizens engagement (Kulkki, 2014; Mayangsari and Novani, 2015; Albino et al., 2015; Manfreda et al., 2019). Sepasgozar et al., (2019) claims that perhaps the relationship between citizens and the SC services is the core aspect of living in a Smart City.

Indeed, innovation and technology together are already clearly leading the so-called *smart city transformation,* also called *smartization* (Bifulco et al., 2016). This requires both the private and the public sector to develop innovative solutions in all the activities and operations involved in the city government (Benevolo et al., 2016; Yeh, 2017).

Urban transportation, regarded as one of the main contributors of greenhouse emissions (EEA), appears to be a critical milestone for cities experiencing these changes, shifting to a new mobility paradigm: the so-called *Smart Mobility.* The mobility sector has been recently in the heart of digital transformation, (Albino et al., 2015; Chen, 2016; Manfreda et al., 2019; Alonso-González et al., 2020) intended to be beneficial for society and environment (Chen, 2016). By using technologies within the reach of public and private realities, it is therefore possible to make Smart Mobility tangible, offering new services for citizens, against relevant issues as energy consumption, time efficiency and environmental impact (Manfreda et al., 2019). This is creating a new economic and competitive environment which companies (of the present and the future) are going to face, to develop their businesses (Sepasgozar et al., 2019; Manfreda et al., 2019).

In this broad context, different authors over time has stressed the relevant role that citizens – as consumers – play for the design, implementation and success of Smart Mobility services (Yeh, 2017). Cities should pivot around their citizens and the success of Smart City – that is to say efficiency, inclusion and innovation - is reached only through their acceptance (Sepasgozar et al., 2019; Gardner and Hespanhol, 2018).

Therefore, understanding citizens' adoption mechanism is crucial, ensuring the predictability of the use of smart mobility services, therefore allowing their implementation (Sepasgozar et al., 2019). Moreover, analysing the individual acceptance and use of ICT applications has increased its popularity in research, over the past few years.

1.2 Studies that have addressed the problem

Past and recent research has supported the relevance of a deeper understanding of users' acceptance of broad ICT applications (Habib et al., 2020). The technological acceptance is considered a critical factor for the diffusion of Smart City applications. Additionally, another part of the research has analysed the social dimension of the technological acceptance, such as the social cognitive theories (Sepasgozar et al., 2019; Alonso- González et al., 2020).

Furthermore, researchers have explored the drivers of users' behavioral intention to use SC applications from a general perspective (e.g. Yeh, 2017; Sepasgozar et al., 2019; Habib et al., 2020) to a more specific one (e.g. Almuraqab & Jasimuddin, 2017; Dutot et al., 2019).

Recently, the setting of Smart Mobility has attracted more consideration and research about consumers' intentions towards new mobility services is expanding. The state of art sees part of the authors focusing on the overall Smart Mobility context (e.g. Ahmed et al., 2020).

While another one prefers going in depth into the adoption and use of particular applications, such as Mobility as a Services (Alonso- González et al., 2020; Schikofsky et al., 2020), autonomous vehicle (Jing et al. 2019; Manfreda et al., 2019), personal mobility devices (Kuo et al., 2019), urban air mobility (Al Haddad et al., 2020).

1.3 Deficiencies in the studies

Despite the major studies on the new sector further research about the consumers/citizens' perspective could be implemented to better understand the role of these key stakeholders. In particular, Yeh (2017) and Sepasgozar et al., (2019) have well highlighted the room for further contributions on citizens' behaviors towards the different Smart City applications especially the technology-based services associated with them, such as Smart Mobility. Going even in depth, Alonso-González et al. (2020) pointed out the relevance of additional investigation on drivers and barriers in adopting On-Demand SM services, calling for further research.

Furthermore, from a cultural perspective, the SM services could be analysed deeply involving different stakeholder groups and socio-cultural environment (Sepasgozar et al., 2019).

Recent literature appears in the need of being expanded toward the "*later phases of the development and implementation of MaaS",* in which *"barriers and enabling factors"* could be explored (Karlsson et al., 2020, p.293).

Considering that SM is a recent and growing trend, there has been limited are few contributions regarding this topic from the citizens' perspective and even less in the European context. This paper aims at filling these gaps developing a quantitative study.

1.4 Relevance of the study

This study aims at contributing as follows. First, it searches consumers' acceptance of Smart mobility services, in the broader field of Consumer Behavior, by extending and combing different research frameworks. Therefore, it contributes to literature including several uncharted variables affecting the intention to use SM services.

By going in depth on an emerging business model, practitioners could benefit from this study, considered as a guide for both public and private companies and organisations, interested in developing Smart mobility services to shape their strategies. Moreover, by framing a model, this study can offer a practical tool for managers to test the acceptance and evaluate the feasibility of these services from a company perspective.

Furthermore, the study intends to contribute to the advance of the so-called *smart city transformation*, providing society and policy, policymakers and their shareholders with insights for the implementations Smart Mobility services. In doing so, cities could enhance their sustainable development and citizens' quality of life.

1.5 Study aim

This study investigates the factors affecting citizens' acceptance of On-Demand Smart Mobility services and assess the influence of each drivers, supporting their implementation.

1.6 Exposé Structure

The present exposé is ordered as follow. First and foremost, some relevant notions are elucidated, and the theoretical framing is presented in details together with the building blocks of the proposed research model. Secondly, the research hypotheses are presented, stressing related gaps and contributions, and displayed in the model. As a summary, the relevant literature reviewed is summarised. Furthermore, a section about the methodological approach explains the details about the research design and context, clarifying the sample; then, the selected procedures for collection and later analysis are proposed. After all, the expected contributions of the study – scientific, practical and social – are presented. In conclusion, the present exposé delineates a draft of the final thesis table of content and the planned schedule.

2. Literature Review & Theoretical Framing

This chapter, organised into two main sections, clarifies some of the key concepts and terms at the core of the present study, performing a literature review and illustrate the theoretical framing in which the model is developed, going in depth into the constructs.

2.1 Literature Review

The following section sheds a light on the main notions on which the study refers to. First of all, the Smart City concept is elucidated presenting an overview on the definitions and an illustration of its main features and building blocks. Afterward, an insight on Smart Mobility is presented and then the discourse is narrowed to the explanation of On-Demand Smart Mobility.

2.1.1 Smart City

The concept of *Smart City* has been in the core of the scientific literature in the past two decades (Albino et al., 2015), and still there is not an agreed definition also due to its spread out in numerous sectors mainly spread between an "hard" domain – buildings, infrastructures, services – and a "soft" one – society, education, policies – (Albino et al., 2015, p.10 ; Lyons, 2018).

The expression was coined in 1990s, referring only to the application of ICT to "modern infrastructures within cities" (Albino et al., 2015, p.4). In the same direction, Harrison et al., (2010, p.2) defined "smart city" as "instrumented, interconnected and intelligent city".

- Instrumented due to the ability of gathering and use real-world data through ICT devices, as sensors and personal ones
- Interconnected refers to the ability of integrating the data allowing the spread out of information
- Intelligent since the implementation of elaborated models and analytics (Harrison et al., 2010)

In the same way, recent literature has continued focusing on the role of technology (Ismagilova et al., 2019). Peng et al., (2017) characterises SC through the adoption of highly-developed technologies, as Internet of Things, Artificial Intelligence, software, into the development of products and services, as smart hardware devices or smart vehicles.

Even though, the ICT component is still regarded the central one from the business perspective, later on it was linked to a more "governance-oriented approach" pivoting around the society and the urban development; as a consequence used to label those policies and regulations oriented to sustainability and improved quality of life (Albino et al., 2015, p.4). Indeed, part of the scholars consider the "social infrastructure" as the "indispensable endowment to smart cities", able to connect people and create relationships (Alawadhi et al., 2012; Albino et al., 2015, p.9; Lyons, 2018). The creation of shared value is ensured by a "multi-stakeholder ecosystem" (Mayangsari and Novani, 2015, p.317) and a "citizen centric approach" (Sepasgozar et al., 2019, p.2).

Summarising these two main points of view, it can be said that Smart City refers to the design and enforcement of ICT infrastructures aiming at sustaining the urban and the society towards growth, ensuring a beneficial effect on economy, citizenship and government (Yeh, 2017). In a similar vein, Ismagilova et al. (2019, p. 90) propose the following definition:

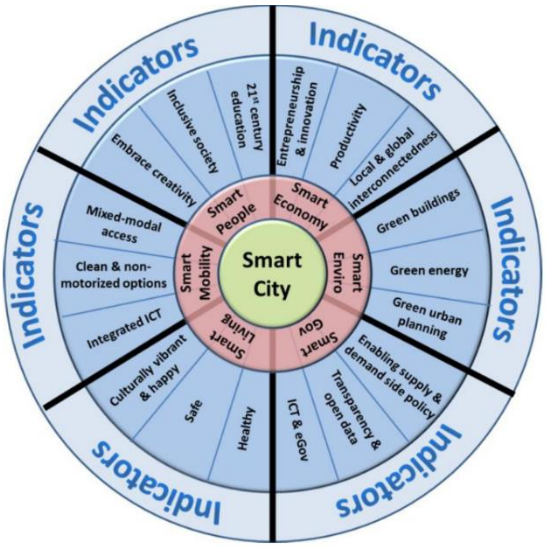
> *"Smart cities use an IS centric approach to the intelligent use of ICT within an interactive infrastructure to provide advanced and innovative services to its citizens, impacting quality of life and sustainable management of natural resources"*

However, literature agrees on the required feature of integration of the components of the urban systems to label a *Smart City*. Indeed, according to the Harvard Business School's Manifesto of Smart Cities (Moss Kanter and Litow, 2009) the application of ICT into urban services is not enough to make a city smart. On the other hand, the framework of these components of SC lacks universality. Giffinger and Gudrun (2010) identified the following: Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living, Smart Governance.

And following authors have supported it (e.g. Ceballos et al., 2018; Luque-Vega et al., 2020) expanding to other specifications (Benevolo et al., 2016). One of the most famous re-elaboration of the Giffinger model is the so-called "Cohen Wheel" by B. Cohen, in which each component is specified by a set of indicators.

Figure 1

Cohen Wheel (Pop & Prostean, 2018 from Kishore & Sohdi, 2015)



In this perspective, Ismagilova et al. (2019) proposed a similar recent classification, stressing the critical role of ICT in the development of Smart City, in: Smart Mobility, Smart Environment, Smart Government, Smart Economy, Smart Living, Smart Citizens and Smart Architecture and Technology.

Indeed, Smart City applications are emerging in the majority of sectors, bringing advantages to people and urban environment in general. Zhang et al. (2017) proposes the following visualisation.

Figure 2

Smart City applications (Zhang et al., 2017)

The development of new business models in the Smart city environment has been studied from a broad point of view (e.g. Letaifa, 2015; Abbate et al., 2019), focusing in depth on the emerging business models (Yeh, 2017; Rama Krishna et al., 2019).

Going in depth, several studies have addressed the consumer behavior in the Smart city context, stressing the relevance of citizens' perspective for the implementation of SC applications (Yeh, 2017) from their design to the management. Indeed, at the micro level, authors claim the key impact of people's attitudes and habits (Karlsson et al., 2020).

2.1.2 Smart Mobility

Smart Mobility is bounded to several challenges offered by the urban environment, as safety, traffic congestion and management, transportation efficiency (Ahmed et al., 2020). And it is considered as one of the most relevant themes in SC, being one of the most promising field to produce broad economic, social and environmental benefits (Benevolo et al., 2016; Tomaszewska et al., 2018). Going into details, scholars proposed the following six classes of benefits (Benevolo et al., 2016):

1- Reducing pollution
2- Reducing traffic congestion
3- Increasing people safety

4- Reducing noise pollution

5- Improving transfer speed

6- Reducing transfer costs

Lyons (2016, p.6) recognises the lack of a univocal definition and proposes the following one: "*connectivity in towns and cities that is affordable, effective, attractive and sustainable".*

However, it is worth stressing since the beginning that Smart Mobility does not mean just a set of alternative means of transport, but a "complex set of projects and actions, different in goals, contents and technology intensity" (Benevolo et al., 2016, p.14). Mobility, for those who live in the city, is also and above all the main way in which environments and spaces are experienced, combined with social innovation. It means opening new cultural, ecological and economic frontiers, improving the quality of life for everyone, redesigning the urban experience of both the center and the suburbs (Habib et al., 2020).

The following are examples of Smart Mobility solutions:

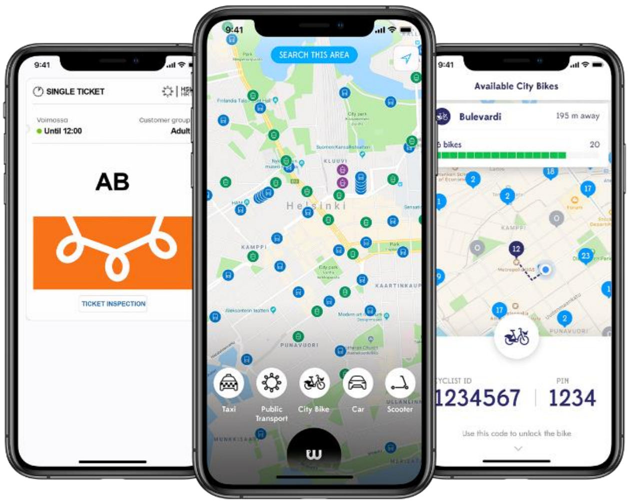
- Mobility as a Services (MaaS)

MaaS comprehends "individual mobility services, preference-based mobility configuration and mobility choices based on individual needs", ensuring users to access to multiple transport solutions and travel management options, both private and public, directly through a unique integrated application (Sepasgozar et al., 2019, p.299).

As an example, Whim is a Finnish all-inclusive MaaS solution, available in Europe and Asia, allowing users booking and paying with public transport, bikes, taxi and other options.

Figure 3

Whim MaaS app (whimapp.com)



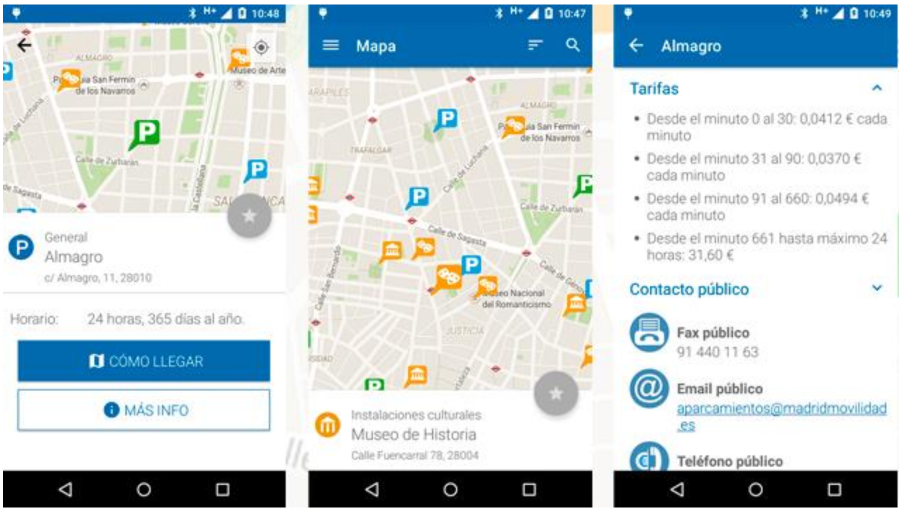
- Intelligent Traffic Management Solution (ITS)

Traffic management is regarded as one of the main urban issues to be led. ITS includes several complex infrastructures, providing decision support and management enabled by artificial intelligence, ending up in ICT and automated services such as change of traffic lights phases (Mangiaracina et al., 2017), road user information, dynamic changes in traffic capacity.

- Traffic Congestion Service

Mainly regarding Smart Parking solution, the urban parking areas are covered by sensors collecting real-time and GPS data, which artificial intelligence elaborates into parking information about the availability, parking fees etc to citizens' via an App (Mangiaracina et al., 2017; Peng et al., 2017).

Figure 4
Parking Madrid App



- Micro-Mobility

Practice and literature together stress how shared mobility has expanded over the past few years in both popularity and scope, reducing traffic congestion and increasing the efficiency of urban travel, as well as addressing sustainability challenges (Machado et al., 2018). It is translated into sharing services of so-called Micro-Mobility, that is to say shared scooters, bikes, hoverboards and similar human and electric-powered means of transport covering shorter distances in the cities (Deloitte, 2019). Although these services can be considered already well-known among the population, giving an example, the Paris bike sharing program – Vélib' – is the largest fleet outside China.

Figure 5
Vélib' (Pinterest)

- Public Transport Innovation concerning the modernisation of public transportations bus, tram and underground services.
- Transport Poverty Reduction promoting the inclusion and equity of mobility, enabling the accessibility and scaling-up of the new services.

Due to the breadth of Smart Mobility implications, literature has focused more on specific applications, instead of seeking to provide a holistic view (Benevolo et al., 2016), as traffic management, route stability and internet of vehicles (Ismagilova et al., 2019).

The following table summarises the Taxonomy of Smart Mobility proposed by Benevolo et al. (2016), which classifies the SM initiatives by key actors:

Table 1
Classification of Smart Mobility initiatives by actors (Benevolo et al., 2016)

Actors		**Examples**
Public transport companies and organisations	Improve the quality of public transport	Change the fleet, add services (as integrated tickets), alternative fuel, AV etc
Private companies and citizens	Carried out by citizens and companies even if supported and stimulated by public policies	Electric vehicles, alternative fuels, car sharing, carpooling, bike sharing, piedibus etc
Public bodies and local governments	Divided into infrastructure – that affects urban mobility – and policies – by the public decision maker to change the mobility system	Parking, bicycle lanes, columns recharge EV, integrated traffic lights, pedestrian zones, incentives measures, redesign of city spaces, etc
The combination of all of them	Intelligent Transport System (ITS) able to collect and process data and	Demand control systems, integrated parking guidance systems, video

	knowledge to implement SM initiatives and policies	surveillance, integrated systems for mobility management; traffic data collection systems

Researchers have been studied closely Smart Mobility as well, from a strategic point of view (Abbate et al., 2019; Karlsson et al., 2020) and from the users involved perspectives, meaning citizens (e.g. Karlsson et al., 2020; Lyons et al., 2020; Sepasgozar et al., 2019).

Benevolo et al. (2016, p.26) have well stressed the proactive role of users, claiming that "smart people are the winning card" for the success of SM services, especially in the later phases of their implementation, that is to say their use.

2.1.3 Smart Mobility On-Demand

Moreover, since *Smart Mobility* refers to a huge number of different applications, this study is going to focus on a those characterized by a common feature: being on-demand, implying that is the customer/citizen himself who requests and decide to use the service, available mainly through an App. These are essential elements which characterise On-Demand Smart Mobility (ODSM), according to Here Mobility:

1- "the commodification of modes of transport", such as bike, car and ride sharing, public transport, also referred as Mobility as a Service (MaaS), ensuring customisation of the service; but also real-time information services, as public transport information, navigation systems and smart parking. It is necessary mentioning that In-app payment is a key related feature.

2- "the collaboration between the public and private sectors", as a recurrent feature in the Smart city environment, ensuring the maximisation of benefits to citizens with a "network effect".

Therefore, in the present study, On-demand Smart Mobility (ODSM) refers to the following categories of services, exemplified with some of the most popular companies and Apps on the market:

- On-demand Transport: Uber, Lyft, Beat, Via, Chariot
- Sharing Services: Cargoroo, Circ, Dott, Easy, Cityscoot, Unu motors, GoVolt, Ofo, oBike, Bicincittà, Jump
- Micro-mobility: Micro Mobility, Wind Mobility, Bit Mobility, Helbiz, Lime, Dott, Hive
- Smart Public Transport
- Mobility as a Service: UbiGo, Mobility Mixx, Moovit, Wunder mobility
- Smart Parking: Wesmartpark, Pay by Sky, Stanley robotics, Cleverciti sistms, Smart Parking

The choice has been made for the following reasons. First, because of the huge popularity that these services have gained recently, stressed by both literature and data, showing the importance of understanding the adoption behavior towards them. Alonso-González et al. (2020, p.1) reports the rapid growth of a "broad spectrum of on-demand modes", increasing users' mode choices and effectiveness in moving in the city. In addition, Machado et al. (2018, p.4) claims that offering "on-demand multimodal services" of transport choices, as well as "real-time journey information", through an App is "the future of urban mobility".

The state of art sees the rapid expansion of this market, which generated globally $34.04 billion in 2019 and is projected to reach more than $70 billion by 2027, rising at a CAGR (Compound Annual Growth Rate) of 20% from 2020 to 2027 (Allied Market Research**)**.

Second, due to the significant differentiation to other implementations of Smart Mobility services, which affect deeply the urban infrastructure, as Traffic Congestion Services. In fact, citizens are not supposed to decide upon the adoption of these kind of services, since they are passively involved in them. As a consequence, this represents a clear limit in the analysis of the drivers of citizens' intention to use SM services. Even though the majority of researchers has not highlighted or took into consideration this aspect, the author has considered relevant narrowing down the field of research, in favour of a greater coherence and validity of the study.

2.2 Theoretical Framing

This section is going to present the theoretical background of the study, providing an insight into the main concepts and theories presented.

Anticipating the proposed research model, the constructs are detailed in the framework of their reference literature and arranged into three different areas of influence.

To address the research problem, the theoretical background is composed by some major theories, as the Unified Theory of Acceptance and Use of Technology, and from literature, to encompass a series of factors affecting citizens' intention to use On-Demand Smart Mobility services.

For the sake of completeness, there are some alternative theories that could have been included in the model, naming some of them: the Technological Acceptance Model, the Diffusion of Innovation Theory, the Theory of Reasoned Action, the Social Cognitive Theory. Both from the psychological and social literature, there are several theories focusing on the behavioral intention of customers, as well as on the technology acceptance, however the chosen ones appeared to be a reasonable choice due to the capacity to summarise the perspectives of different studies. Giving an example, the Unified

Theory of Acceptance and Use of Technology (UTAUT) has been preferred over the Technological Acceptance Model, since the former is heavily influenced by the latter, including its constructs.

2.2.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

The scientific investigation of the attitude and acceptance of Smart Cities technology-based applications has gone through the applications of a series of theories – social and economic –and numerous adaptations and modifications to specific context.

The theory, developed by Venkates, Morris, Davis and Davis in 2003, gives an explanation of the factors determining the behavioral intention to use a technological application. It is well known since it comprehend a selection of elements coming from eight different research framework: Theory of Reasoned Action (TRA) from Davis, Bagozzi, and Warshaw (1989); Technology Acceptance Model (TAM) from Davis (1989), Davis et al. (1989), Venkatesh and Davis (2000); Motivation Model (MM) from Davis, Bagozzi, and Warshaw (1992); Theory of Planned Behavior (TPB) from Taylor and Todd (1995); Combined TAM and TPB (C-TAM-TPB) from Taylor and Todd (1995); Model of PC Utilization (MPCU) from Thompson, Higgins, and Howell (1991); Innovation Diffusion Theory (IDT) from Moore and Benbasat (1991); and Social Cognitive Theory (SCT) from Compeau and Higgins (1995) and Compeau, Higgins, and Huff (1999).

Therefore, it simplifies the constructs, as summarized in the table below, gaining the advantage of describing a more comprehensive view on the technology acceptance behavioral intention (Alwahaishi & Snášel, 2013).

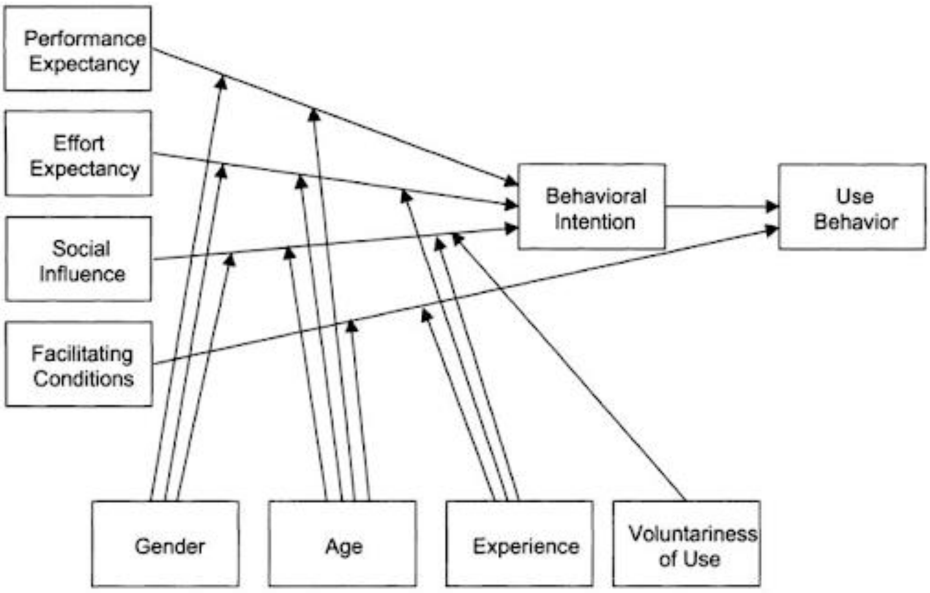
Table 2
UTAUT Constructs and original models (Author)

Model	***Construct***	***UTAUT Construct***
TAM, TPB, Combined TAM-TPB, Motivation Model	*Perceived usefulness*	***Performance expectancy***
PC Utilisation	*Job-fit*	
Innovation Diffusion Theory IDT	*Relative advantage*	
Social Cognitive Theory SCT	*Outcome expectations*	
TAM, TPB, Motivation Model	*Perceived ease of use*	***Effort expectancy***
PC Utilisation	*Complexity*	
IDT	*Ease of use*	
TRA, TPB, Combined TAM-TPB	*Subjective norm*	***Social influence***

PC Utilisation	*Social factors*	
IDT	*Image*	
TPB, Combined TAM-TPB	*Perceived behavioral control*	***Facilitating conditions***
PC Utilisation	*Facilitating conditions*	
IDT	*Compatibility*	

Namely Performance expectancy, Effort expectancy, Social influence and Facilitating conditions are claimed to be "direct determinants of user acceptance and usage behavior" (Venkatesh et al., 2003, p.447), showed in the research model. Furthermore, the model encompasses the moderating role of four factors: Gender, Age, Experience and Voluntariness Of Use.

Figure 6
Unified Theory of Acceptance and Use of Technology (Venkatesh, 2003)



Despite the subsequent updates of the theory – UTAUT 2 (Venkatesh et al., 2012) – this study preferred the original one for the following reasons. First, it makes possible highlighting the Smart Mobility acceptance constructs and their cause-effect relationship to citizens' attitude; while the other one is already filled in with more detailed elements that risk to shifting the focus to less relevant items, for the purpose of this study. Giving an example, UTAUT 2 (Venkatesh et al., 2012) includes Hedonic motivation and Price Value.

Second, the combination between UTAUT and the other constructs, that are going to be introduced in the model, fits better than with the other technology acceptance theories, gaining simplicity and therefore effectiveness in showing the connection to the outcome variable.

Moreover, being technology one of the main features of the Smart City ecosystem, exploring citizens' attitude related to this specific feature appears fundamental to be explored.

The UTAUT model has been broadly used to assess the technology adoption behavior towards Smart City applications and literature has usually expanded and integrated the original framework rearranging it with additional variables.

In this perspective, several researches have been carried out in the field of e-government services, broadly (e.g. Almuraqab & Jasimuddin, 2017; Habib et al., 2020) and even more specifically as Smartcard (Loo et al., 2009), telehealth services (Cimperman et al., 2016).

Another part of the research has investigated the intention to use smart products (e.g. Mayer et al., 2011; Magsamen-Conrad et al., 2015).

As already highlighted, technology adoption has been analysed also specifically for Smart Mobility services. Several the studies are based on the Technology Acceptance Model, adapted and widen toward different services (e.g. Chen et al., 2016; Kuo et al., 2019; Sepasgozar et al., 2019; Ahmed et al., 2020; Al Haddad et al., 2020; Schikofsky et al., 2020)

On the other hand, as an expansion of the TAM, the UTAUT has proved to be valuable recently. Zhou et al., (2020) adapted the UTAUT model in relationship to self-service delivery service, Manfreda et al., 2019 on the adoption of Autonomous Vehicles.

Investigating the technological acceptance of smart technologies is considered crucial for their implementation and diffusion (Magsamen-Conrad et al., 2015; Sepasgozar et al., 2019) and for the purpose of this study, the UTAUT is regarded a well-grounded theory to approach the acceptance of Smart Mobility technologies and the following constructs are going to be incorporated in the proposed model.

2.2.2 Smart City related Individual Traits Constructs

As highlighted before, the Smart City is revolutionising the urban context requiring the citizens to accept and adapt in this new environment, shaped by the key values of innovation, technology and sustainability. On the other hand, it has to be recognised that these values have already been changing people's mindset and beliefs, starting with the effect of globalisation, developing positive attitudes towards innovation, technology and sustainability.

Studies have explored the relationship between lifestyle practices and sustainable consumption behavior (Axen et al., 2012). For instance, Alonso-González et al. (2020) revealed the positive influence on Netherlands in adopting MaaS of a positive multimodal mind-set and the positive attitude towards public transport and low car drive. Beforehand, Axen et al. (2012) assessed that pro-environmental lifestyle and attitude positively affect pro-environmental behaviors, such as buying an electric vehicle.

Indeed, this study aims at overcoming the limits of previous ones, focused mainly on the technology-related factors and excluding the relationship with personal beliefs and inclinations.

Past research has already started stressing the need of deeper a focus on social aspects when investigating citizens' adoption of technologies (Yeh, 2017). Furthermore, Lanzini and Khan (2017) have marked habits and current behavior as "important predictors of future transportation behavior".

Based on these considerations, the proposed model comprehends a number of constructs related to the individual traits, specifically those complementary to the Smart City context, in order to understand whether and how they could drive the intention to use ODSM services, namely: Technologically minded individuals and Environmental concern.

2.2.3 Issues of Smart City applications Constructs

For the same purpose to enrich the technology-acceptance-related constructs from the UTAUT with further potential drivers of the citizens' behavioral intention to use ODSM services, this study considers also the effect of the main issues related to the Smart City fields of applications, so valid to Smart Mobility as well.

Literature agrees that, due to the ability to collect a huge range of data and information from users, SC applications arises several privacy and security issues (Zhang et al., 2017; Braun et al., 2018), especially if more and more embedded into our daily activities and urban infrastructures.

As such, these factors could affect citizens' trust into the services but as well as the providers, since together with their diffusion, consumers' need of trust escalates (Michler et al., 2020).

Trust is regarded as fundamental to Smart City environment, affecting citizens' participation (Kundu, 2019) and intention to use services supplied by the government (Carter & Bélanger, 2005). In this connection, considering trust as one of the fundamental factors of the success of SC (Braun et al., 2018), this studies explores the relationship between trust and Smart Mobility services adoption.

Researchers proved the relevance of two main dimensions of trust: trust in technology itself, as the main features of the services, and in the government system, as the provider; which in tandem are considered a must (Carter & Bélanger, 2005).

Both factors are claimed to positively impact the intention to use SC services and to constitute central role in promoting their use (Munyoka & Maharaj, 2019).

Going into details into trust in technology, it is referred to the user's willingness "to depend on a technology across situations" (McKnight et al., 2011 , p. 12:6), and it is often claimed as institution-based trust (Carter & Bélanger, 2005; Almuraqab & Jasimuddin, 2017), based on the "individual's perceptions of the institutional environment, such as the structures, regulations and legislation that make an environment feel safe and trustworthy" (Carter & Bélanger, 2005, p.9).

Research corroborates that usually technological innovations could be related to threat to personal information and privacy (Yeh, 2017); also, in the specific context of public services (Loo et al., 2009) and Smart City (Habib et al., 2020). However, it is worth stressing that these issues are regarded as significantly influential on user acceptance of innovations (Featherman et al., 2010).

As a consequence, such technological issues are expected to affect the acceptance and adoption of e-government services, regarded as the integration of ICT for the supply of public services. In particular, the more citizens feel confident that personal information is going to be managed properly, the more they are likely to support e-government initiatives. Accordingly, ensuring that users' data is reasonably protected from third parties, avoiding security breaches and so forth (Silcock, 2001).

The degree to which government is successful in providing public services is strictly linked to level of trust in it (Horsburgh et al., 2011). In addition, past and present literature has already proved the critical role of Trust in Government in users' intention to use e-government services (Carter and Bélanger, 2005; Welch et al., 2005; Ozkan & Kanat, 2011; Habib et al., 2020).

Past and recent literature has explored the trust in government in the Smart environment, as Welch et al., (2005), Ozkan & Kanat (2011), Almuraqab and Jasimuddin (2017) in the broad e-government services.

In this respect, the following table summarises the literature upon these issues.

Table 3
Literature review on trust (Author)

Reference	Constructs
Almuraqab & Jasimuddin (2017). Factors that influence end users' adoption of smart government services in the UAE: A conceptual framework	Trust in Technology Trust in m-government
Carter & Bélanger, (2005). The utilization of e-government services: citizen trust, innovation and acceptance factors	Trust of Internet Trust of Government
Habib et al., (2020). Factors that determine residents' acceptance of smart city technologies	Trust in Technology Trust in Government
Ozkan & Kanat, (2011). e-Government adoption model based on theory of planned behavior: Empirical validation	Trust in Government Trust in the Internet
Welch et al., (2005). Linking citizen satisfaction with e-government and trust in government	Trust in Government

Yeh, H. (2017). The effects of successful ICT-based smart city services: From citizens' perspectives	Trust in the ICT-based SC services
Tussyadiah et al., (2017). Attitudes toward autonomous on demand mobility system: The case of self-driving taxi	Trust in Technology

3. Research Hypotheses

3.1 Behavioral intention to use On-demand Smart Mobility Services

Behavioral intention has been used as a central variable in a number of Consumer Behavior theories, since it is regarded as a well-grounded predictor of actual behavior from the Theory of Reasoned Action (Fishbein & Ajzen, 1977).

It composes the outcome variable of several research frameworks, strictly linked to pure Consumer Behavior as in the Theory of Reasoned Action and the Theory of Planned Behavior, up to multiple applications and extensions into the famous technology acceptance research, such as the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology. Each theory has its own specificities and determinants of the behavioral intention.

The Theory of Planned Behavior refers to the *"individual's intention to perform a given behavior";* where intentions are considered *"to capture the motivational factors that influence a behavior"*, being able to indicate *"how hard people are willing to try or planning to exert, in order to perform the behavior"* (Ajzen, 1999, p.181).

In the Smart City research, several studies have addressed the users' behavioral intention to use SC services (e.g. Sepasgozar et al., 2019; Habib et al., 2020), considered relevant since it is claimed to determinant of user's use of the technology in question (Habib et al., 2020).

In particular, it has been applied to different context and more or less specific product categories. Mayer et al. (2011) researched BI to use Smart Products; Dutot et al. (2019) focused on Smartwatch; Almuraqab and Jasimuddin (2017) of Smart government services.

Specifically referring to Smart Mobility, authors have investigated several services. Jing et al. (2019) investigated the behavioral intention to adopt MaaS; Urban air mobility (Al Haddad et al., 2020); Kuo et al. (2019) personal mobility devices; Haustein et al. (2018) electric cars.

3.2 Research Hypotheses

In order to address the research problem, this study proposes a new model, based mainly on research of the past 5 years about the Smart City technology adoption and specific mobility applications intention to use.

The key constructs and their indicators are taken from both theory and literature, in order to comprehend the different orders of drivers of citizens' adoption. The constructs and the related hypotheses are discussed below, emphasising the corresponding gaps and expected contributions.

3.2.1. Performance Expectancy

From the UTAUT model, Performance Expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p.447). According to the broad Social Cognitive Theory, service quality is considered as a key factor affecting customers' service adoption (Bandura, 1989); which has proven to be valid also specifically for the technology acceptance of services (Ribbink et al., 2004; Loo et al., 2009; Mayer et al., 2011; Magsamen-Conrad et al., 2015; Yeh, 2017). In this context, it describes citizens' perception that adopting ODSMS is going to improve their daily life.

H1: Performance Expectancy on Smart Mobility services positively affects citizen's intention to use

3.2.2. Effort Expectancy

Recent researches have shown citizens' conviction that SC applications are the means through which their quality life could improve, and a higher level of efficiency could be reached (Jing et al., 2019; Habib et al., 2020). Citizens could assume that urban technologies and innovations demand them a high degree of effort to both learn and use them (Sepasgozar et al., 2019). Indeed, the UTAUT model introduces Effort Expectancy, as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003), as a determinant of BI to adopt technology.

In particular, researchers have found a relevant correlation between effort expectancy and behavioral intention towards SC services (Loo et al., 2009; Magsamen-Conrad et al., 2015; Habib et al., 2020). In line with the UTAUT model, the present study hypothesises the positive effect of citizens' Effort Expectancy on Smart Mobility services on their intention to use them.

H2: Effort Expectancy on Smart Mobility services positively affects citizen's intention to use

3.2.3. Facilitating Conditions

Conforming with the previous hypotheses, the UTAUT defines Facilitating Conditions as "the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003), affecting directly users' technology acceptance. In line with previous research about technology acceptance of SC services (e.g. Loo et al., 2009; Magsamen-Conrad et al., 2015), the present study refers to surrounding urban environment that conceive using Smart Mobility services easy to use, hypothesising that:

H3: Facilitating Conditions positively affects citizen's acceptance of SM services

Since the impact on users' technology acceptance of the above-mentioned drivers – performance expectancy, effort expectancy and facilitating conditions – has already been extensively analysed and validated, they are included in the model. On the other hand, the fourth determinant – Social Influence – is excluded in line with previous research on technology acceptance of Smart City applications (Loo et al., 2009; Magsamen-Conrad et al., 2015; Yeh, 2017; Habib et al., 2020) and in relationship to the research problem, which is better addressed omitting it.

3.2.4. Self-efficacy

Self-efficacy is a driver of BI to adopt technology, retrieved from Social Cognitive Theory, to refer to individual's confidence in his/her capability in performing an action. Recent researches have proven the effect of Self-efficacy with Behavioral intention towards Smart City services (Habib et al., 2020). Furthermore, referring to Smart mobility, Sepasgozar et al., (2019) positively related "user's confidence in their own knowledge of Urban Service Technologies" to their intention to use them; Habib et al. (2020) found that interviewed regards smart-traffic systems and IoT devices of easy employment and not that different from what they are used to. As a consequence, the proposed research model hypothesises that:

H4: Self-efficacy positively affects citizen's acceptance of SM services

3.2.5. Technologically minded individuals

Yeh (2017) and Sun and Jeyarai (2013) has shown that the higher the individual personal innovativeness, the earlier he/she is intended to adapt to innovations, defining it as the "degree to which an individual is willing to try any new information technology on his/her own". The positive impact of the individual innovative attitude has been proven also in Smart Mobility (Haboucha et al., 2017; Manfreda et al., 2019). Therefore, the present study hypothesises that citizens who are more incline to new technologies are more incline to use SM services as well.

H5: Technologically minded individuals will more likely use SM services

3.2.6. Environmental Concern

Broadly consumer behavior literature has described the "ecologically conscious" consumer behavior, going in depth in the drivers, among which the environmental concern is enumerated (e.g. Roberts & Bacon, 1997). On the other hand, due to the strict correlation between Smart City and sustainability, the degree of concerns on environmental protection and preservation has been stressed by researchers as a factor impacting positively the perceived usefulness and satisfaction with SC application (e.g. Ghazal et al., 2016). In particular, from research's point of view, Haboucha et al.,

(2017) positively related greater concern with higher propension to use shared vehicles; Alonso-González et al. (2020) concluded that On-Demand Smart Mobility services result less appealing to those individuals with lower environmental sensitivity. For what has been said, the study explores the relationship between ecologically conscious citizens and their behavioral intention, hypothesising:

H6: Environmental Concern positively affects citizen's intention to use SM services

3.2.7. Trust in Technology

Research corroborates that usually technological innovations could be related to threat to personal information and privacy (Yeh, 2017); also, in the specific context of public services (Loo et al., 2009) and Smart City (Habib et al., 2020).

At the same time, research has shown some inconsistencies. Giving an example, Manfreda et al. (2019) found that Autonomous Vehicle adopters give for granted the security and privacy protection of the product, that is to say no significant relationship between perceived security and the intention to use. In the same way, Jing et al. (2019) noticed the same conclusion for MaaS adoption.

Even though literature has not provided a univocal definition of trust, it is regarded as the propensity of one party to place confidence in the other party's actions, "especially when the former is in a potentially vulnerable situation". Research (Carter and Bélanger, 2005; Habib et al., 2020) claimed that it is the residents' perception of security and privacy that influence trust, though the intention to use the services. These remarks have led the present study to examine the relationship between Trust in Technology and Behavioral intention to use SM services.

H7: Trust in Technology positively affects citizen's intention to use SM services

3.2.8. Trust in Government

Technological infrastructures and services allows local governments to gather a huge amount of information and big data about their users, which could be misloaded and feared by citizens to be used for other purposes, as control and surveillance (Habib et al., 2020). Trust in government has been described by Almuraqab and Jasimuddin (2017, p.17) as "the public's assessment of government based on their perceptions of political authorities', agencies' and institutions' integrity and ability to provide services according to the expectations of the citizens". Munyoka and Maharaj (2019) discloses that the higher level of trust, the lower the perceived risk associated with the services.

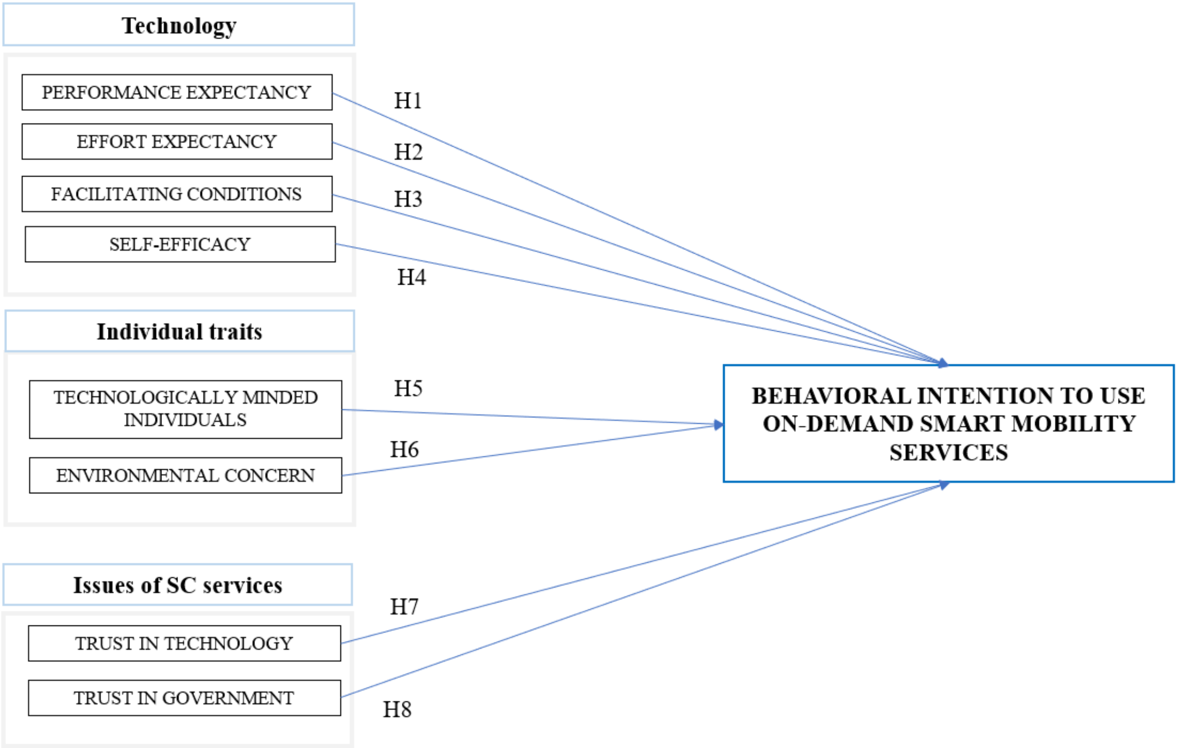
As a consequence, trust in government appears to be one of the key issues related to the implementation of broad Smart City applications (Habib et al., 2020), and the study hypothesises:

H8: Trust in Government positively affects citizen's intention to use SM services

3.3 Research Model

As a result of what has been explained in the previous sections, the present research conceptual model is proposed.

Figure 7
The proposed research framework



As showed, the model includes three different sets of constructs, being equivalent to distinct types of drivers that could affect the citizens' acceptance of On-Demand Smart Mobility services. The proposed framework captures technology-adoption characteristics, individual traits toward it and trustworthiness.

The first – Technology– refers strictly to those drivers related to the technological acceptance of ODSM services, indeed are retrieved from the UTAUT, including Self-efficacy in using the technology.

The second – Individual traits – reflects a more personal and attitudinal point of view and its possible influence on the intention to use. Particularly, the main reason of this choice – as already mentioned formerly – is to investigate whether certain individual traits, giving an example being inclined to innovation, could affect citizens' behavioral intention toward the services.

Lastly, similarly as the previous group, the third one – Issues of Smart City services – concerns the influence that the main issues, embedded by definition into the Smart City context and correlated applications, namely the trustworthiness versus the technology and the government, could have on citizens' intent to accept Smart Mobility services.

3.4 Literature Review Table

Table 4
Literature review table (Author)

Reference	*Contributions to this study*
Habib et al., (2020). Factors that determine residents' acceptance of smart city technologies	• Research gap • Constructs and items and definitions Application of the UTAUT to the Smart City context
Almuraqab & Jasimuddin, (2017). Factors that influence end-users' adoption of smart government services in the UAE: A conceptual framework	• Research
Alonso-González et al., (2020). Drivers and barriers in adopting Mobility as a Service (MaaS)–A latent class cluster analysis of attitudes	• Background • Theoretical framing • Constructs
Bifulco et al., (2016). ICT and sustainability in smart cities management	• Literature • Background
Yeh, (2017). The effects of successful ICT-based smart city services: From citizens' perspectives	• Research gap • Relevance of citizens' perspective • Construct: personal innovativeness • Relevance of both individual and objective drivers of adoptions
Manfreda et al., (2019). Autonomous vehicles in the smart city era: An empirical study of adoption factors important for millennials	• Construct: technology minded individual
Sepasgozar et al., (2019). Implementing citizen centric technology in developing smart cities: A model for predicting the acceptance of urban technologies	• Technology acceptance model in the context of Smart City • Mix of technology-acceptance and social theory • Research gap

Al Haddad et al., (2020). Factors affecting the adoption and use of urban air mobility	• Research
Kuo et al., (2019). Pedestrians' acceptance of personal mobility devices on the shared path: A structural equation modelling approach	• Research
Ismagilova et al., (2019). Smart cities: Advances in research—An information systems perspective	• Literature
Schikofsky et al., (2020). Exploring motivational mechanisms behind the intention to adopt mobility as a service (MaaS): Insights from Germany	• Literature research • Model

4. Methodology

The present chapter elucidates the methodological approach that has been used to address the research problem and answer to the research question. In particular, it details the selected sample and the relative research context; then, the data collection instrument and procedures are explained in details. Lastly, the statistical tests to validate both the constructs and the overall are listed.

4.1 Methodological approach

This study applies a quantitative research approach, due to the following main reasons. Firstly, a quantitative analysis is useful to collect hard facts and figures, in order to draw general conclusion from the research in line with the main aims of this research. Secondly, since the present study formulated several hypotheses about the citizens' intention to use SM services, they require to be validated though statistical analysis.

4.2 Research context and sample description

To test the research hypotheses above, citizens from urban areas in Europe are going to be surveyed. An age minimum is set at 16 years old, since is on average the minimum requirement to get a driving licence in the European Union. This is taken into consideration due to the fact that ensure a certain level of autonomy in mobility manners and decisions.

It is worth stressing that it is not necessary that the respondents have already used or known a Smart Mobility service, since the study aim is to investigate citizens' intention to use the services and not the satisfaction with them.

4.3 Data collection procedures

To perform the data collection required to test the research hypotheses, an online-based survey is going to be implemented.

The mean through which data will be collected from the sample is going to be a self-administrated online questionnaire, including items measuring the *Performance Expectancy, Effort Expectancy, Facilitating Conditions, Self-efficacy, Technologically-minded Individuals, Environmental Concern, Trust in Technology and Trust in Government.*

The online questionnaire has been preferred among the data collection methods because of its numerous advantages: time and cost effectiveness, eliminate the interviewer effect and variability, convenience for respondents, allow data collection in foreign countries so the sample is going to be more representative.

It is going to be designed with the software Sphinx, based on the research framework and hypotheses outlined above.
Due to the novelty of the services and the limited knowledge about them that the audience may have, to introduce the topic to the respondents, a small presentation will be showed at the beginning.

In the first section, the survey is going to collect the demographic data, that could be proven to be relevant for the study.

Then, the second section is going to focus on the citizens' intention to use SM services and is going to be designed into the following sections, as the classes of drivers defined in the previous paragraphs:

1- Technology acceptance
2- Individual traits
3- Issues related to Smart City applications

An additional section is going to be developed for the collection of the demographic data,

The questionnaire is going to cover 8 constructs and related 31 measures. For the sake of validity of each measures, items for the chosen constructs presented in the research model are retrieved from previous researches, therefore already validated and then adapted at the specific context of Smart Mobility.

The table below offers a comprehensive overview on the constructs and the related items.

Table 5
Constructs and items (Author)

Construct	***Original Items and Source***	***Adapted Items***
Performance Expectancy (PE)	PE1. I find mobile Internet useful in my daily life. PE2. Using mobile Internet increases my chances of achieving things that are important to me. PE3. Using mobile Internet helps me accomplish things more quickly. PE4. Using mobile Internet increases my productivity. (Thomas et al., 2013)	*PE1. I find ODSMS useful in my daily life.* *PE2. Using ODSMS increases my chances of achieving things that are important to me* *PE3. Using ODSMS helps me accomplish things more quickly* *PE4. Using ODSMS increases my productivity*
Effort Expectancy (EE)	EE1 . Learning how to use mobile Internet is easy for me.	*EE1. Learning how to use ODSMS is easy for me*

	EE2. My interaction with mobile Internet is clear and understandable. EE3. I find mobile Internet easy to use. EE4. It is easy for me to become skilful at using mobile Internet. (Thomas et al., 2013)	*EE2. My interaction with ODSMS is clear and understandable* *EE3. I find ODSMS easy to use* *EE4. It is easy for me to become skilful at ODSMS*
Facilitating Conditions (FC)	FC1 . I have the resources necessary to use mobile Internet. FC2. I have the knowledge necessary to use mobile Internet. FC3. Mobile Internet is compatible with other technologies I use. FC4. I can get help from others when I have difficulties using mobile Internet. (Thomas et al., 2013)	*FC1. I have the resources necessary to use ODSMS* *FC2. I have the knowledge necessary to use ODSMS* *FC3. ODSMS is compatible with other technologies I use* *FC4. I can get help from others when I have difficulties using ODSMS*
Self-efficacy (SE)	SE1. I think I can use UST features efficiently SE2. I think I can use UST successfully SE3. I believe I can use UST by myself (Sepasgozar et al., 2019)	*SE1. I think I can use ODSMS features efficiently* *SE2. I think I can use ODSMS successfully* *SE3. I believe I can use ODSMS by myself*
Technologically minded individuals (TEC)	TEC1. I am usually the first to try out new technologies. TEC2. I have deeper knowledge regarding new technologies than others TEC3. I am excited about the possibilities offered by new technologies TEC4. I am hesitant to try out new technologies (Manfreda et al., 2019)	*TEC1. I am usually the first to try out new technologies* *TEC2. I have deeper knowledge regarding new technologies than others* *TEC3. I am excited about the possibilities offered by new technologies* *TEC4. I am hesitant to try out new technologies*
Environmental Concern (EC)	EC1. I am concerned about global warming	*EC1. I am concerned about global warming*

	EC2. I don't change my behaviour based solely on concern for the environment EC3. I rarely worry about the effects of pollution on myself and my family EC4. It is acceptable for an industrial society such as ours to produce a certain degree of pollution EC5. I am willing to spend a bit more to buy a product that is more environmentally friendly (Haboucha et al., 2017)	*EC2. I don't change my behaviour based solely on concern for the environment* *EC3. I rarely worry about the effects of pollution on myself and my family* *EC4. It is acceptable for an industrial society such as ours to produce a certain degree of pollution* *EC5. I am willing to spend a bit more to buy a product that is more environmentally friendly*
Trust in Technology (TT)	TT1. I trust the security of the smart city services, Legal/technical infrastructure of smart city services is sufficient in protecting my information TT2. I trust the devices that collect and process my data while I am using smart city services TT3. I can count on smart city services to protect my information (Habib et al., 2020)	*TT1. I trust the security of ODSMS, legal/technical infrastructure of ODSMS is sufficient in protecting my information* *TT2. I trust the devices that collect and process my data while I am using ODSMS* *TT3. I can count on ODSMS to protect my information*
Trust in Government (TG)	TG1. I trust public departments and institutions TG.2 I trust city capabilities in providing safe, smart city services. TG3. I trust that citizens' interest is city's first priority. TG4. I trust City's procedures to protect my personal information (Habib et al., 2020)	*TG1. I trust public departments and institutions* *TG2. I trust city capabilities in providing safe ODSMS* *TG3. I trust that citizens' interest is city's first priority* *TG4. I trust City's procedures to protect my personal information*
Behavioral Intention to use (BI)	BI1. I intend to continue using mobile Internet services in the future BI2. I will always try to use mobile Internet services in my daily life BI3. I plan to continue to use mobile Internet services frequently (Venkatesh et al., 2012)	*BI1. I intend to continue using ODSM services in the future* *BI2. I will always try to use ODSM services in my daily life* *BI3. I plan to continue to use ODSM services frequently*

Measurements are going to be based on a 5-point Likert scale varying from "strongly disagree" (1) to "strongly agree" (5). The measurements are going to be adapted from the previous literature, applied in the same field. Closed-ended questions are going to be included as well.

The language preferred is going to be English at first. Nevertheless, later on also additional versions in the main European idioms could be implemented, so that to facilitate the data collection, ensure a higher response rate and sample representativeness, as well as validity of the answers.

Beforehand, a pilot questionnaire is going to be performed to test the questionnaire and spot any incoherence, weaknesses or possible room of improvement, performing a first revision.

Then, the final questionnaire is going to be disseminated among individuals across Europe and controlled for the proper age group. And spread among the sample through:

- Social media channels
- Transportation companies channels
- Public sector companies and organisations
- Universities
- Online platforms by country (EUSurvey, Surveymonkey, Sphinxonline for France)
- Snowball technique

Data are going to be collected over a period of about 1 month, starting in November.

4.4 Data analysis procedures

A quantitative Confirmatory Factor Analysis (CFA) technique is going to be performed to test the construct validity. Later than, a Structural Equation Model (SEM) is going to be used to evaluate the proposed research framework and scout the interrelations among constructs.

In addition, in order to determine the sufficiency and reliability of the measurement model and related constructs, convergent validity/SmartPLS is going to be adopted. To handle with missing values, the calculations using SmartPLS will consider the recommendations of Grimm and Wagner (2020) to improve the accuracy of the estimations.

The internal consistency of the measures is going to be validated, through Cronbach's alpha and Composite reliability (CR). In the same way, discriminant validity, analysing whether each construct is nonidentical from the others.

Furthermore, the third analysis to confirm the model is going to be the calculation of the overall model Goodness of Fit (GoF) index (Becker et al., (2012).

5. Expected Contributions

This chapter provides an overview on the expected theoretical and practical contributions of the research.

5.1 Expected contributions to theory building

This study aims at making the following scientific contributions. First, it searches consumers' acceptance of one specific Smart City application, Smart Mobility, (Yeh, 2017; Sepasgozar et al., 2019). In particular, the behavioral intention to use the peculiar category of On-Demand Smart Mobility services has not been deeply explored in research.

In addition, the study contributes with a model for investigating the technology acceptance at an individual level, testing the validity of notable constructs in an innovative context (Sepasgozar et al., 2019). Not only this, since the model is enriched with several additional variables that could affect the behavioral intention to use Smart Mobility services (Karlsson et al., 2020), offering a comprehensive overview on the individual's drivers of the decision-making.

Second, since literature stressed the relevance of a deep investigation of user experience with "Urban Service Technologies" necessary to achieve Smart Cities (Kumar et al., 2018), this study proposes a conceptual model integrating variables addressing the main features of the experience.

5.2 Expected implications for business and society

By going in depth on an emerging business model, practitioners could benefit from this study. First, the study is proposed to become a guide for both public and private companies and organisations interested in developing Smart mobility services.

Second of all, the insights of the main stakeholders involved – citizens – could become crucial indications for those intended to design and develop Smart mobility products and services. Moreover, by framing a model, this study can offer a practical tool for managers to test the acceptance and evaluate the feasibility of these services from a company perspective. Since, the model is supported by a questionnaire, this could be the mean through which citizens' acceptance could be explored, supporting decision-making on future product developments and market strategies. For instance, new service prototypes could be evaluated.

Therefore, public and private companies could shape strategies to satisfy customer's expectations in the best way. In this respect, endorsements are detailed as follows.

Since the proposed study reveals the relevance of the perceived usefulness for the adoption of ODSM services, their design and implementation should prioritize the maximisation of the performance benefits for the citizens. In the same way, it is needed to communicate to and inform the potential users of such advantages in order to attract a wider audience, supported by the understanding of the factors and mechanisms behind Smart Mobility adoption.

Similarly, the insights on the individual traits which positively affect the BI to use ODSM services could be exploited to get the identikit of the potential customers and new potential market groups, so that companies could develop strategies to best satisfy their needs and to target them efficiently.

Last but not least, the study intend to contribute to the advanced of the so-called *smart city transformation*, affecting society and policy, policymakers and their shareholders.

Indeed, local governments responsible for the promotion of the services could benefit from the results to influence and enhance the citizens' acceptance of Smart Mobility services they would like to implement. For this purposes, the study highlights the advantages that citizens expect from the services, that policymakers need to take into consideration. In the same way, the model reveals the significance of the technology related issues, including privacy and security concerns, which government should ensure.

By supporting the implementation of such services, citizens' quality of life could be positively affected, providing an improved living environment. In the same perspective and as stressed before, through Smart Mobility projects, cities could enhance their sustainable development. Thus, local decision-makers and planners could align their regulations and policies.

6. Thesis chapters' overview

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7. Workplan

Table 6
Workplan timetable

Period	Activity
30th September	Exposé submission
First half of October	Questionnaire development; Continue literature review
Second half of October	Instrument pilot test; Questionnaire revision; thesis writing of instrument development and test
November	Data collection to data analysis
Beginning of December	Revise the thesis writing
First weeks of January	Thesis presentation design
13th January	Thesis submission

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