Dynamic Capabilities in times of change

A qualitative study exploring the role of Dynamic Capabilities and Business Model Innovation Process in a Smart Mobility sector context.

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ABSTRACT

By utilizing the Dynamic Capabilities Framework (DCF) provided by Teece, this study explores how organizations leverage Dynamic Capabilities (DCs) to address rapid changes in times of change where uncertainty governs. By analyzing the activities that firms perform in relation to the sensing, seizing and transforming capabilities, this study enhances the understanding of how Business Models (BMs) are formed and refined. To elucidate this in a practical manner and hence facilitate the understanding, an expertise research method within the mobility sector particularly focusing in Mobility as a Service (MaaS) context was performed.

The empirical results outlined the different challenges faced by mobility firms while trying to sense, seize and transform opportunities and threats in their environment. In addition, findings enabled an analysis which shed light on the alignment and discrepancies between theory and practicality. For instance, empirical data demonstrated that the DCF should be seen as a reciprocal model and not as a sequential and linear one as theory states. This means that activities and approaches within the framework can belong to more than one of the DCs at the same time since in the end these are flitting things. Moreover, the conducted interviews demonstrated that sensing is related to cognitive capabilities that enable the understanding of the environment. Transforming can be associated with technical and practical capabilities as it demands firms to act. This enabled to understand that seizing is somehow a midpoint between sensing and transforming as it requires a little bit of both understanding and preparing to act to eventually evolve.

As a consequence, a modified version of the DCF framework has been developed and proposed as a guidance for businesses to not fall behind. With the support of the framework, firms can frequently assess their ability to sense, seize and transform according to changes happening in their surroundings. Hence, this research suggests that firms make use of the model and incorporate it into their day to day practices as change is not about a one-time transformation but a never ending one. By doing so, companies are expected to achieve and sustain market fit in order to stay competitive and ensure their long-term survival.

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BM Business Model

BMI Business Model Innovation

DC Dynamic Capability

DCF Dynamic Capabilities Framework

MaaS Mobility as a Service

PT Public Transport

SM Smart Mobility

UITP International Association of Public Transport

1 INTRODUCTION

This first section will provide a thesis introduction. First, a general background is provided to give a direction and context for the selected field and topics. The problematization and purpose of the study as well as the research questions are presented afterwards. Subsequently, a short description of the limitations to which the study is constrained to is provided. Finally, a summary of the thesis structure is provided.

1.1 General Background

Emerging technological and social trends are driving radical changes into the world of transportation leading to new ways for people to travel from one point to another. This is particularly evident in urbanized regions where the economy and population are accelerating and expanding hence stressing the existing transportation ecosystems, which calls to redefine the concept of mobility (Corwin & Pankratz, 2017). This represents several challenges as well as opportunities that mobility players must consider when developing their business strategies. The inappropriate transportation planning and use of land as well as the lack of well thought traffic management strategies are current issues that have recently gained huge attention in published works (Corwin & Pankratz, 2017). Traffic congestion, which mainly derives from high rates of car ownership, represents one of the biggest challenges in urban areas associated with negative social, environmental and economic impacts (Bull, 2003). Thus, Corwin and Pankratz (2017) state that it is crucial that mobility firms start looking at recent technological innovations and understand how to leverage them by incorporating them into their networks and strategies to address the emerging mobility challenges.

As the time goes by, more transportation alternatives enter the mobility picture, bikesharing, electric scooters, ride-sourcing to mention some. This leads to a broader range of alternatives that could offer cheaper, faster, more environmentally friendly and customizable ways of commuting (Corwin & Pankratz, 2017). However, the more available alternatives the more complex it gets to manage and access them as each of these imply different platforms, booking processes, payment methods among other factors which users find confusing and impractical. As a result, the rate of adoption of these alternatives remains low, making consumers stick to their traditional transportation modes, mainly private cars (Goodall, Dovey, Bornstein & Bonthron, 2017). Mobility as a Service (MaaS), an emerging mobility concept that draws from

technological and social trends, promises to be a potential solution for this by integrating the different modes of transportation into a single on demand service application.

As per Hensher, Mulley, Ho, Nelson, Smith, and Wong (2020), MaaS can be defined as a digital platform that customizes and integrates trip creation, acquisition and delivery throughout the different available transportation modes. Another simple definition provided by Smith and Hensher (2020) describes MaaS as a service that enables users to plan, reserve and pay for different transportation services by using a single digital interface. At the moment, there is limited literature and empirical data regarding this concept. Nonetheless, it has gained much attention during the last few years and research is currently being conducted, hence literature around the subject is expected to increase (Hensher, Mulley & Wong, 2018) as well as the number of pilots implemented worldwide (Corwin & Pankratz, 2017). The city of Helsinki, considered to be the pioneer of the MaaS movement, introduced the Whim app in 2016. Since then the privately owned MaaS app allows habitants in Helsinki to purchase public transport (PT) tickets, get bike and scooter rides and order a cab at any moment. This can be done by acquiring different mobility plans according to the users' need; pay as you go, unlimited monthly rides subscription or a combination of alternatives (Goodall, Dovey, Bornstein & Bonthron, 2017). Moreover, Whim has expanded internationally reaching different cities within the countries of Belgium, Austria, UK, Switzerland and Japan. Based on Whim's future growth, the list of cities is expected to get longer (Whim, 2022).

UbiGo, another privately owned MaaS pilot launched in late 2016 for the city of Gothenburg, included a mobility service that integrates different types of transport modes ranging from PT to car rental and bike riding. All this combined in a single sign-on application that included 24/7 support service, payment and billing solutions as well as the sharing option across different users (Goodall, Dovey, Bornstein & Bonthron, 2017; Fuildtime, 2022). In 2018 after the success of Gothenburg's UbiGo pilot, the app was commercially launched in Stockholm city facilitating the planning, booking and acquiring tickets for the different transport modes via the UbiGo app. One of the main purposes of UbiGo was to reduce car congestion and pollution, hence it targeted car users as the main customer segment. While UbiGo trial analysis demonstrated that this was in part achieved, it also showed that many current PT users changed habits into more car usage such as car-pooling and cab (Holmberg, Collado, Sarasini & Williander, 2016). After this, UbiGo was no longer supported by state funds and thus the lack of profitability forced it to close down in 2021 (Brown, 2021).

Furthermore, in 2019 the Beijing transportation commission (BTC) collaborated with Amap, the Chinese leader in mapping, navigation and location-based services. Together they launched the pilot MaaS app "Beijing Green Transportation Integrated Service Platform", which resulted in Beijing residents being able to make use of the already existing Amap app and get additional mobility features (Zhang & Zhang, 2021). The application integrates the different available transport modes such as bus, train, cycling, taxi service and private car to provide Smart Mobility (SM) services by offering real time travel data such as traffic congestion, bus and train positions, bike location, etc (Zhang & Zhang, 2021). Despite the great result and user adoption of the incorporation of MaaS services into the existing map platform, it does not include the payment function which places the MaaS app into a less advanced integration stage (Zhang & Zhang, 2021) making it an evident area to further address.

As mentioned above, a few MaaS pilots have been implemented worldwide, some of them still ongoing while others have already concluded. Although these differ from one to another, they all share a similar purpose: stepping away from the individual transport modality towards mobility solutions that are used as a service (Goodall, Dovey, Bornstein & Bonthron, 2017). This means shifting from acquiring goods (cars) to purchasing access (service) to better mobility choices. The freshness of the concept makes it hard to determine the speed in which this shift will totally take over. Nevertheless, per Corwin and Pankratz (2017) it is expected to affect not only businesses within the automobile industry but others as well for instance energy, health care and media industries. Therefore, for key players of the different sectors, particularly from the mobility one, to stay competitive they must reconsider how they create and deliver value to their stakeholders. This re-evaluation will most likely lead to changes in the Business Model (BM) of firms.

According to Sarasini, Sochor and Arby (2017), due to the MaaS concept being at a 'pre-commercial stage' there is still not a suggested BM to achieve a successful development and adoption of MaaS. Moreover, the authors argue that as of now there has not been any conducted research to understand how Business Model Innovation (BMI) can generate sustainable value within the MaaS field. Notwithstanding, according to Chesbrough (2007), the success of a business is driven by organizational innovation, which involves the design of its BM as well as the innovation on its offerings, i.e. products and services. In the same vein, the concept of BMI has gained much attention as it is perceived as an enhancing tool that encourages

entrepreneurship and innovation within firms' strategies (Ghinoi & Di Toma, 2021). BMI refers to the process or actions that alter a current BM by developing either a completely new one or upgrading the previous one (Zott et al., 2011). In practice this can be translated into a company's ability to align and adapt its resources and capabilities with future trends in order to create, deliver and capture the value of the new customer proposition. This, according to Teece (2010), augments the chances for a company to achieve a sustainable competitive advantage as well as outstanding levels of performance (Ghinoi & Di Toma, 2021).

Hence, it can be argued that the BMI process is more likely to succeed in companies that possess the ability to foresee and grasp opportunities enabling them to rapidly adapt to the different dynamic, uncertain and complex business environments (Teece, 2018). Teece, Pisano and Shuen (1997) refer to this ability as Dynamic Capabilities (DCs). According to the authors, DCs can be defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments". The purpose of the theory of DCs is to underpin the "things" or factors that originate competitive advantage in environments in constant motion. By this, decision makers can use the DCs theory and framework as a guidance to understand where to concentrate their attention when periods of change arise (Teece, 2007). Moreover, DCs are considered to play a key role when fast changing technologies emerge requiring rapid and innovative responses from companies (Teece, Pisano and Shuen, 1997). The interdependence between BMI and DCs calls for companies to pay closer attention to what specific capabilities are required when rethinking their BMs while trying to stay competitive. This study will focus on understanding how new BMs are formed with a particular emphasis on MaaS BMs. By doing so, the role of DCs (sensing, seizing and transforming) in BMI will be illustrated and further discussed.

1.2 Problem

During the last decades, there have been huge contributions and progress to better understand BMs. Despite this, there is still a lack of clarity on how firms develop and further implement new BMs (Bekendam, 2017). Due to the scarce understanding towards BM change, companies continue to allocate a high amount of resources on innovating their current offerings (services or products) rather than investing on their BMs transformations. According to Christensen, Bartman and Bever (2016), managers tend to invest in their existing products or services since they perceive it as less risky than aiming to develop completely new BMs. Hence, it is not a

surprise that most of the new BMs come from emerging companies rather than well-established firms (Wladawsky-Berger, 2018).

In a similar vein, due to the freshness of the concept of MaaS a common definition has not been established yet (Arias & García, 2020). Current literature on the field highlights the evident complexity of MaaS implementation as well as the need to further study and understand the challenges faced and capabilities required to better manage and achieve successful MaaS implementations (Goodall, Dovey, Bornstein & Bonthron, 2017). During recent years, only a few MaaS pilots have been implemented, the majority taking place in Europe and the US. Additionally, for practical reasons the scope of these pilots has been narrowed to a limited number of users in selected regions and based on certain criteria, which implies to the exclusion of important contextual aspects. The lack of complete representation results in a knowledge gap which calls for further academic and empirical research on the subject.

1.3 Purpose

During the last decade, urban mobility has evolved. This evolution can be associated, to a large extent, with the emergence of new technological and social trends which are reshaping the concept of mobility. This mindset shift from high car ownership desire to the interest in finding more sustainable travel alternatives has led to the development of new transportation modes as well as the appearance of the concepts of Smart Mobility (SM) and Mobility as a Service (MaaS). As a consequence, mobility players who aim to sustain a competitive advantage in the market are forced to think beyond their current strategies by innovating and expanding their offerings, i.e. products and services. However, research (Boston Consulting Group, 2014) reveals that due to the high volatility and uncertainty of markets and business environments, traditional product and service innovation is no longer enough to drive future firms' survival. Therefore, Business Model Innovation (BMI) is needed as it represents a crucial strategy for companies to maintain value creation growth and hence sustain their competitive advantage.

That being the case, the purpose of this study is twofold. First, to increase the understanding of how new BMs are formed. This is done by looking into how firms use and manage DCs by mastering the sensing, seizing and transforming that underlie such capabilities. Secondly, this research aims to expand current knowledge of the specific challenges of the above processes

when applied into a MaaS context. The above purpose leads to the following research questions:

RQ1: How do mobility firms use Dynamic Capabilities (DCs) to tap into the mobility trends?

RQ2: By doing this, do they also innovate their Business Models (BMs)?

1.4 Limitations

It is important to emphasize that the researcher has identified different factors that might affect the current study's results and outcomes. First, the research is only focusing on the mobility industry, particularly in the implementation of MaaS which is an example of servitization. Due to this, assessment regards the applicability of the research's outcomes into other areas should be performed beforehand, specially when the intention is to make use of them in a context that excludes the presence of offerings in form of service. Moreover, the variety of definitions identified for the terms under study, as elucidated on chapter 2, might limit the research's effectiveness as analyzing becomes harder when there is not a clear and common understanding of the concepts being discussed.

Moreover, time is a factor that plays a crucial role in terms of research limitations. The fact that this study has been performed and documented in less than three months must be taken into consideration as it is directly related with the limited number of expert interviews conducted. Hence, it is worth noting that a bigger expert headcount could have led to additional insights as well as possibly augmenting the validity of the findings. Additionally, the findings on qualitative studies are subject to the researcher's interpretation (Creswell & Creswell, 2018), which may or may not always represent what the primary source aims to communicate. Moreover, qualitative Creswell and Creswell (2018) further claim that the researcher may obtain valuable qualitative information that due to confidentiality and ethical considerations must remain private which represents a limitation when trying to build credibility.

Finally, considering the business background of the researcher and the study's purpose, the research does not include any knowledge when it comes to technical aspects of a MaaS implementation. This might call for further research from a technical point of view as it plays an important role during the MaaS implementation.

1.5 Thesis Structure

Section 1 serves as an introductory chapter where the reader gets to understand on a broad level what the study is all about. This includes a general background setting the context of the research, a description of the problematization supported and followed by a statement of purpose and a brief explanation of the limitation to which the study is subject to. Chapter 2 elucidates the selected literature that helps build an understanding of the main concepts addressed; Business Model Innovation (BMI), Dynamic Capabilities (DCs), Mobility as a Service (MaaS). This section also includes a preliminary framework designed based on the selected literature and which will be further utilized to elaborate a deep analysis of the collected empirical data.

Consequently, chapter 3 presents the research methodology that the researcher has decided to use for this study. This chapter illustrates the structure, the sources and processes of data collection as well as providing an explanation of how this data will be analyzed. Section three ends up reflecting the reliability and validity as well as the ethical considerations accounted throughout the whole study. Moreover, chapter 4 elaborates on the empirical findings obtained from the conducted interviews with industry experts. Subsequently, chapter 5 provides an analysis and discussion of the empirical results by comparing them with existent DCs theory. Based on this, the theoretical preliminary framework presented in section two is adjusted, therefore a final framework is presented. Finally, chapter 6 outlines the contributions of the study and arguments for integrity, explanatory capacity and relevance of the final framework. This section concludes with a set of future research recommendations.

2 LITERATURE REVIEW

The purpose of this section is to introduce the theoretical concepts serving as foundation for the study performed. A literature review on the topics of BM, BMI, DCs and SM will be provided with a strong emphasis on the DCs as key success factors of firms engaged in a BM change required when making MaaS part of their offerings.

2.1 Business Model

The concept of Business Model (BM) is not recent as it has been present in academic literature and discussions for over sixty years now. The term was first used in a journal article by Bellman Clark, Malcolm, Craft, and Ricciardi in 1957. After this, there has been an increase in the usage of the concept as well as a constant evolution in terms of its definition (Foss and Saebi, 2017). It has evolved from mainly being associated with operational and functional aspects within a firm (Wirtz, Pistoia, Ullrich & Göttel, 2016) to be understood as a means for the proper implementation of a business strategy (Dahan, Doh, Oetzel & Yaziji, 2010).

According to Günzel and Holm (2013), the amplification of diverse concepts around the BM field may be a result of the wide range of sectors interested in understanding and applying the BM concept. For instance, in the technology field the concept is seen as a supporting tool to develop technological innovations. Hence analyzing a BM can help understand why some organizations are better able to seize value from a particular technology in contrast to others (Fallahi, 2017). Although the increase in interest and application of the BM concept in literature has led to more research, a misalignment among different academics towards its definition is still evident leading to a horde of different interpretations (Zott, Amit & Massa, 2011).

According to Osterwalder (2004), a BM is "a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money". The value that a firm provides to consumers, the firm's structure and its connectivity with partners are elements described in a company's BM (Osterwalder, 2004). Shafer Smith & Linder (2005) state a BM represents the crucial functions that any organization must carry out in order to stay competitive and survive. Hence a BM can be defined as a structure that serves to first identify who the customers are with the aim to understand their needs, deliver satisfaction by addressing those needs, and generate revenue from the provided value (Baden-Fuller & Haefliger, 2013).

Another definition provided by Teece (2010) states that BMs manage the logic, the information and additional data that upholds a customer value proposition as well as a feasible cost and revenue structure that enables the firm to deliver such value. The author further argues that BMs that are hard to imitate and excel to address specific customer needs can enable competitive advantage (Teece, 2010). Moreover, Gibe and Kalling (2019) define BM as "an idea concerning the interrelation of the things inside and outside an organization". A BM links the internal organizational factors such as activities, resource base, culture, structure with firms' external factors like suppliers, competitors, regulations (Kalling & Gibe, 2019).

Despite the different definitions, most of them share some commonality as these refer to how firms create and deliver value to their customers as well as how this value is captured by companies. Worth noting that all conceptualizations are valid as they offer diverse perspectives. This study understands a BM as the profit-making strategy of a firm including a set of key components whose interconnection outlines how it creates and delivers value to its customers and overall stakeholders while ensuring that value is being monetized (Teece, 2010; Kalling & Gibe, 2019).

2.1.1 Business Model Key Components

As mentioned above, a BM is integrated by different components that together make up the framework of a BM. Same as for the BM definition, there are different academic perspectives when it comes to outlining the key BM elements (Zott et al., 20111). According to the creators of the well-known BM canvas, Osterwalder and Pigneur, a BM is made up of nine different building blocks that are related one to another and describe how a firm runs their day to day business while creating and delivering value to stakeholders. These nine components are: Key Partners, Key Activities, Key Resources, Value Propositions, Customer Relationships, Channels, Customer Segments, Cost Structure and Revenue Streams (Osterwalder & Pigneur, 2010).

Johnson, Christensen and Kagermann (2008) have developed a BM structure that has also been highly recognized and accepted within the business field. The proposed structure contains four main elements; customer value proposition, profit formula, key resources and key processes. The authors argue that the most important element is customer value proposition and the precision in which it is managed as it entails targeting the customer, understanding its problem to fulfill it by offering a solution, i.e. product or service. As mentioned above, different

perspectives around the key BM components have emerged. Nonetheless, several comprehend three main components that are linked one to another; (1) Company's value proposition, (2) the operational structure needed to create and deliver that value proposition, and (3) a profit model (Teece, 2010; Foss and Saebi, 2015; Saebi & Foss, 2017).

2.1.2 Business Model Innovation

Firms must be aware that generic BMs are rarely successful as in most cases adjustments and sometimes full reconstruction is needed before they can become profitable structures (Teece, 2018). Therefore, when studying the BM field, it is crucial to understand that the BMI concept is an important extension of the field. In an effort to better understand BM change and contribute to the BM available literature, different academics have started to study the concept of Business Model Innovation (BMI). However, as per Foss and Saebi (2015), the different BM definitions make it complex to provide a standard definition to BMI. This has resulted in scholars having come up with different conceptualizations and perceptions towards BMI. For instance, some academics refer to BMI as radical changes or complete replacement of the BM while others view BMI as incremental modifications within one or more components of a BM (Chesbrough, 2007; Khanagha, Volberda, & Oshri, 2014, 2014; Frankenberger, Weiblen, Csik & Gassmann, 2013).

Mitchell and Coles (2003), state that BMI happens when a firm replaces its BM for a new one that provides customers with offerings that were not previously available. Foss and Saebi (2017) define BMI as "designed, novel, nontrivial changes to the key elements of a firm's BM and/or the architecture linking these elements". Moreover, as per Casadesus-Masanell and Zhu (2013) BMI can be defined as finding new ways to generate and deliver value to stakeholders by redefining their value propositions while ensuring that value is being captured. Similarly, Frankenberger, Weiblen, Csik and Gassmann (2013) refer to BMI as a new way to generate and capture value through the modification of one or more BM components. Hence, BMI can imply an incremental adjustment in a single BM component, an addition to the existing BM or a radical change of the BM implying the total replacement of the current BM with a completely new one (Khanagha, Volberda, & Oshri, 2014; Chesbrough, 2007).

Given the diverse existing definitions and views, this study will be based on the BMI conceptualization that describes it as a dynamic process in which the modification of one or more BM elements takes place in order to change and enhance stakeholder's value proposition.

2.2 Dynamic Capabilities

2.2.1 Foundation

The theory of Dynamic Capabilities (DCs) developed in 1997 by Teece, Pisano and Shuen has gained much attention as it explains and analyzes how successful companies sustain a competitive advantage by adapting and rebuilding competences in constantly changing environments (Qaiyum & Wang, 2018). Before DCs theory was developed, two major perspectives to analyze a firm's competitive advantage existed: The market-based view developed in 1985 by Porter and the resource-based view in 1991 by Barney. Although these views were highly accepted by academics, according to Cordes-Berszinn (2013) both lack considering the fact of constant market changes. The emergence of DCs theory addresses this gap by explaining the firm's sources of competitive advantage during times of change (Teece, 2007).

2.2.2 Different Perspectives

Teece, Pisano and Shuen (1997) first defined the concept of DCs as "the firm's ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments". However, Zollo and Winter (2002) argue that while the previous definition explains what DCs are and how they work, it is scarce when it comes to addressing where these come from. Hence they define DCs as established organizational patterns which companies use to systematically develop and alter their operations and practices in order to enhance effectiveness. Another definition provided by Martin and Eisenhardt (2000) describe DCs as processes to integrate, recompose, acquire and deliver resources in order to meet and in some cases, even generate market change. The authors state that "Dynamic Capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die" (Martin & Eisenhardt, 2000, p. 1107). Moreover, Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece, and Winter (2007) define DCs as the ability of a company to generate, expand, and change its base of resources. Tangible, intangible and human resources together with the firm owned and controlled capabilities make up the so-called "base of resources" (Helfat et al., 2007) .

As described above, different academics have their own way to understand and articulate the concept of DCs but in the end, all of them share similar foundations. For example, Zollo and Winter (2002) refers to DCs as organizational *patterns*, Eisenhardt and Martin (2002) describe

them as organizational *routines* and *processes* and Helfat et al. (2007) define DCs as organizational *abilities.* Moreover, as mentioned by Bjørnstad and Fredebeul (2021), most of the existing definitions have their own flaws. For instance, the definition provided by Helfat et al. (2007) and Zollo and Winter (2002), are scarce on explaining how a firm can adapt to an environment in constant change. This deficiency is addressed in Teece's expanded works (2007; 2018) as he distinguishes three main DCs that firms must perform in order to adapt to change; sense, seize and transform (Bjørnstad & Fredebeul, 2021). Academics such as Helfat and Martin (2015) label them as dynamic managerial capabilities as they describe crucial capabilities that managers need to sustain constant evolution and innovation fit (Teece, 2007).

Moreover, in his latest work Teece (2018) states that DCs may vary from one company to another and that firms might not perform equally strongly in all of them. For example, while a company could be great at sensing new opportunities, it could be frail at grasping them by identifying new BMs or the other way around (Teece, 2018). DCs aim to identify the source of competitive advantage within a firm to provide further guidance to decision makers in uncertain and constant changing times (Teece, 2007). Additionally, Teece, Pisano & Shuen, (1997) state that DCs become a key success factor for firms when new technologies emerge which require fast response and adaptation. As the purpose of this research is to explore DCs in terms of a firm's ability to sense, seize and transform in order to adapt to emerging trends and changing environments, the definition provided by Teece et al. (1997) and Teece (2007) will be utilized. Hence this study defines DCs as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997).

2.2.3 Dynamic Capabilities Framework

Furthermore, with the purpose to enhance the understanding of DCs, the Dynamic Capabilities framework (DCF), shown in figure 1 was developed by Teece. By combining theory and empirical data, the DCF aims to explore how firms achieve and sustain competitive advantage (Teece, 2011; Teece, 2018). According to Teece, Peteraf and Leih (2016), the need to comprehend technological shifts which result in changes in companies is crucial and therefore is included and represents an important factor in the DCF. Moreover, the framework considers factors such as flexibility and integration as well as transformation of internal and external capabilities (Teece et al., 2016). This consideration helps understanding how changes in the environment impact firms and vice versa.
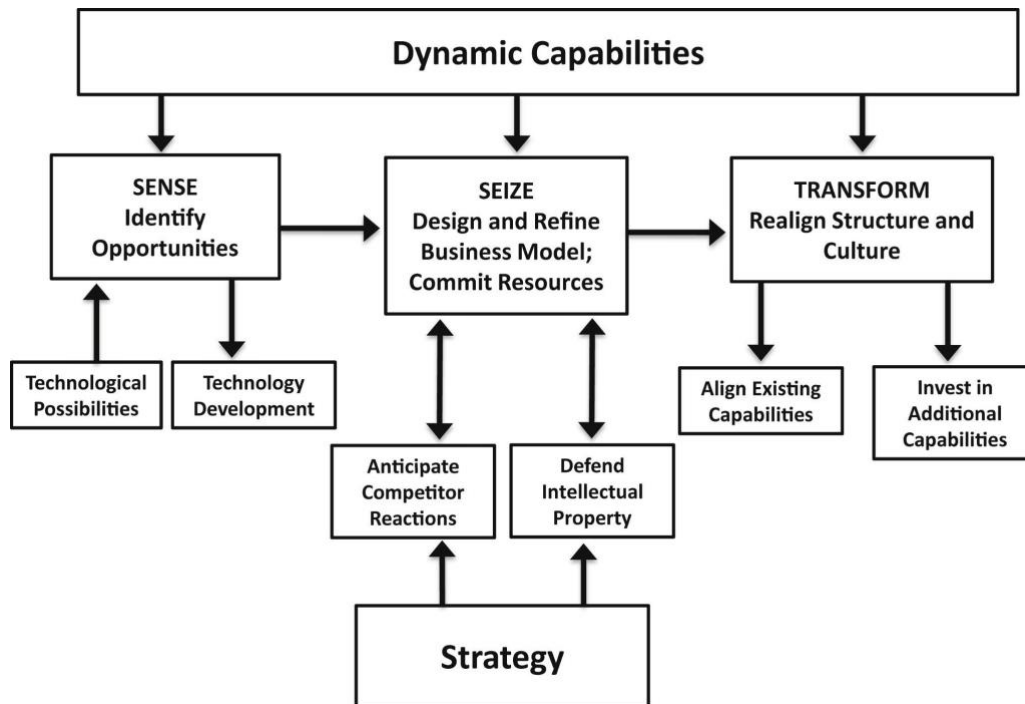
Figure 1: Dynamic Capabilities Framework (Teece, 2018, p. 44)

Although the illustration of the DCF by Teece (2018) summarizes on a broad level the interdependence between DCs, BMs and strategy, the researcher believes it is relevant to create a modified version of DCF in order to provide clarity and support the further analysis. The main purpose is to include under each of the DCs (sense, seize, transform) additional elements that have been mentioned in Teece's different works (2007; 2016; 2018) but for some reason are not encompassed in his framework. Hence, figure 2 presents the adjusted version of the DCF which better illustrates not only what but how a firm can adapt to an environment in constant change.
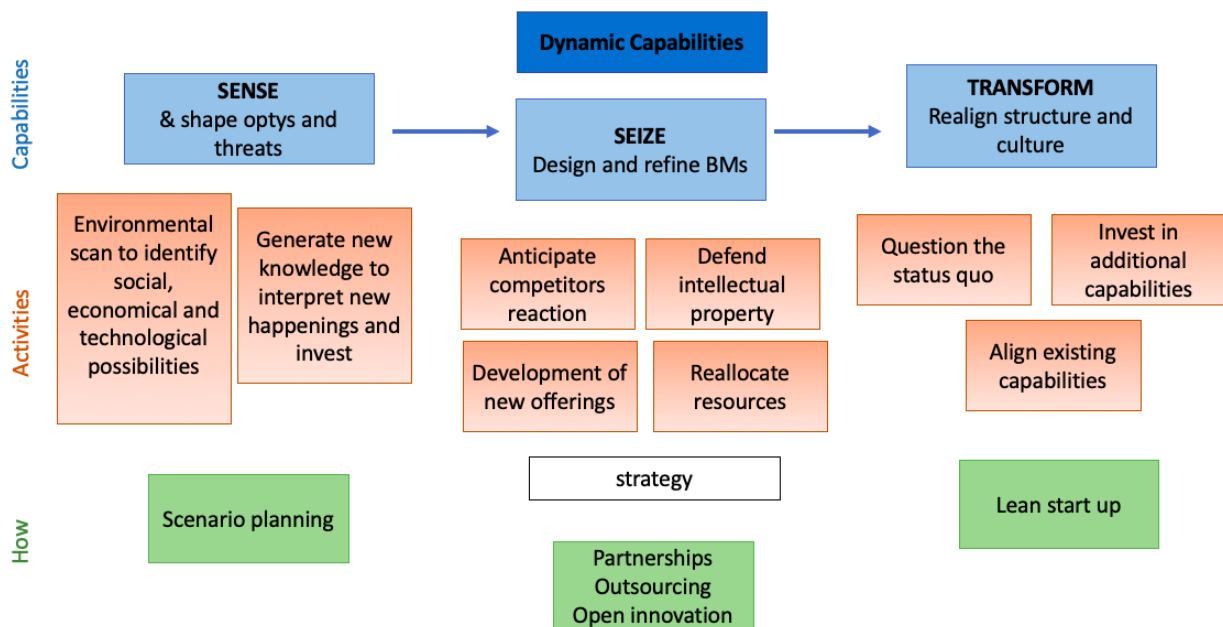
Figure 2: Expanded Dynamic Capabilities Framework based on Teece 2018

2.2.4 Sensing, Seizing & Transforming

Likewise, to provide more clarity and support the further analysis, the three DCs identified by Teece (2007; 2016; 2018) will be described with more detail below.

Sense

Sensing is described as the firm's ability to foresee opportunities and threats (Teece, Peteraf & Leih, 2016). Among the sensing activities to identify and shape these opportunities there is the examination of the technological environment and its trends, the generation of new knowledge by observing and performing research on consumers and competitor's behavior, and the interpretation of new happenings to assess the evolution of technologies in relation to consumers, suppliers and competitors (Teece, 2007). Moreover, Teece (2007) states that investment in R&D is likely to happen within this phase as it plays an important role and serves as a complementary resource for the activities mentioned above. These activities help firms sense growth opportunities before these become obvious to the whole market (Teece, 2007). To achieve this Teece, Peteraf and Leih (2016) state that a set of capabilities including

generative sensing, sense making, scenario planning application, and the "buy" of real options[1] is required.

The capability of generative sensing refers to the proactive approach of constantly generating assumptions about the future and testing them to facilitate the development of new offerings and BMs (Teece, Peteraf & Leih, 2016). Moreover, Teece et al. (2016) indicate that the sense making capability implies using abductive reasoning when trying to sense opportunities as it makes use of all existing information to create sense making patterns. Moreover, the authors suggest scenario planning as a complementary tool for generative sensing. Scenario planning is useful for handling uncertainty and enabling quick responses as it helps illustrate likely future scenarios together with potential responses to them, which decision makers can leverage and act accordingly in times of uncertainty and change (Teece et al., 2016). Lastly, Teece et al. (2016) argue that companies with solid DCs are prone to "buy" real options through investing in R & D to further make use ("exercise") of them when convenient.

Seize

Teece (2007) refers to seizing as the ability to organize the company's resources to grasp the previously sensed opportunities. This can be seen as the ability to convert gained knowledge into action "getting things done" by allocating assets where they are needed to better seize these opportunities. In order to achieve this, "firm's resources must be orchestrated astutely and coordinated with the activities of partner firms to deliver value to customers" (Teece, 2018, p. 43). Moreover, the author states that the development of new offerings (products or services) as well as the operational adjustments (processes, logics, BMs) are required in order to address those opportunities. Hence, the design of viable BMs and the resource mobilization and investment play a crucial role in the seizing stage. In the same vein, Teece et al. (2016) remark the importance of having flexible operational processes and BMs to quickly adapt to changing demands. Creating alliances with suppliers and competitors, appealing for outsourcing and adopting open innovation practices are some of the ways to achieve such flexibility (Teece et al., 2016).

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[1] A real option is described as a monetary important right available to managers of a firm to undertake or renounce to some election, usually regarding business opportunities or potential investments. Examples of these options can be deciding whether to expand or not a business as well as to postpone or end a project (Hayes, 2021).

While adapting and being flexible, firms must ensure that their BMs dictate where, when and how to invest and that they stay aligned with their technologies. Although a company can be great at rapidly sensing opportunities, if investments are not done in the right time it will struggle to transform them into performance (Teece, 2007). Thus, a company that by sensing is able to foresee upcoming trends must invest in emerging technologies that based on hypotheses are likely to be successful and establish a competitive market position (Teece, 2007). Additionally, companies must be aware that any investment decision is to some extent risky due to environmental uncertainties (Teece, 2007; Teece et al., 2016) as well as decision makers' errors and unaware biases (Teece, 2007).

Transform

As per Teece et al. (2016), the transforming stage can be defined as constantly assessing resources, logics and BMs to enter on a continuous evolution or "renewal" loop in order to stay competitive. In his previous work, Teece (2007) refers to this stage as reconfiguration since it enables a company to "recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change" (Teece, 2007, p. 1335). Transformation is required not only to sustain a market fit and hence a competitive advantage but also to stay away from path dependencies generated by routines (Teece, 2007). According to Teece et al. (2016), reconfiguration involves questioning the status quo and breaking with traditional ways of thinking which requires managers to communicate well and provide guidance towards the needed change. Notwithstanding, change may result harder due to conflict of interests, humans' resistance, or lack of clear communication (Teece et al., 2016). Embracing this change becomes smoother in companies where there is a shaped culture to accept rapid adaptation and high levels of change (Teece, 2007; Teece et al., 2016).

Research has shown that well established firms find the transformation stage harder than new enterprises as they have more entrenched assets and procedures to reconfigure than start-ups (Teece et al., 2016; Teece, 2018). In spite of the additional efforts required, mature firms can still perform successful transformations (Teece et al., 2016). Additionally, firms' organizational structure influences the degree of responsiveness and flexibility towards change (Teece, 2007). For instance, firms with a flatter and decentralized organizational structure excel at communicating since information flows smoother and hence their ability to adapt and react to changes is higher than the ones with high hierarchical structures (Teece, 2007; Teece et al., 2016).

Furthermore, Teece et al. (2016) present the lean startup methodology as a strong supportive tool for companies going through the reconfiguration process, especially in the era of the Internet. This method encourages learning through experimentation and enables a firm to rapidly test products, processes or BMs at an early development stage to either discard them or continue to invest in them. In this way, managers can identify the best way to reconfigure their organizations based on current and future plans (Teece, 2018). Additionally, this approach embraces the fact that the utility of business plans is constrained by the environment's uncertainty (Teece et al., 2016), which goes in line with the foundation of the DCs concept.

2.3 Smart Mobility

During the last decade, the concept of Smart Mobility (SM) has gained huge attention as a means to address the issues derived from transportation systems in highly urbanized areas. The term unfolds from the merger between digitalization and the mobility sector, hence the development of new technologies has been applied to increase the efficiency of mobility networks around the world (Bıyık, Abareshi, Paz, Ruiz, Battarra, Rogers, Lizarraga, 2021). Several academics have come up with different definitions for SM. For instance, Gabrys (2014) considers SM as an approach that helps reduce pollution produced by cars and human congestion while increasing the quality of mobility through promoting environmentally friendly transport alternatives.

According to Aletà, Alonso and Ruiz (2017), SM entails different actions that improve the mobility of users whether it is by foot, public, private or any other mode of transportation. Moreover, Allan and Newman (2018) claim that SM requires more than just the insertion of technologies into urban mobility as it also requires residents to trace and follow transportation practices in a rational and smart way. Another definition provided by Tomaszewska and Florea (2018) states that SM intends to enhance logistic and transport activities by making use of digital smart technologies with the main purpose of reducing negative impacts of mobility such as pollution.

2.3.1 Mobility as a Service

With the purpose of achieving a more sustainable PT infrastructure, the term Mobility as a Service (MaaS) has recently emerged particularly in developed economies such as Europe and

the US (World economic forum, 2021). MaaS is considered to be a relatively new concept (Kamargianni & Matyas, 2017; Arias & García, 2020) with a lot of innovation and exploration potential (Deloitte, 2017; Sarasini et al., 2017). Because of its newness, a common definition has not been established yet. Despite this, Arias and García (2020) state that a proper conceptualization should at least include: a wide and diverse range of mobility modes, one single user oriented interface, real time data, trip planner and payment functions. Likewise, Kamargianni and Matyas (2017) agree with the fact of the concept being relatively fresh. Nonetheless, they claim it integrates different well-studied terms such as sustainability, integration, interconnectivity and optimization of the transport services, smart and seamless mobility. Hence, these concepts serve as pillars when trying to provide a definition of MaaS.

Different academics have named Sampo Hietanen as the founder of MaaS term as he introduced the concept of mobility package into literature (Arias & García, 2020). Hietanen (2014) describes MaaS as a system that distributes and delivers the need of users to transport through a one single service provider platform while offering different mobility modes and packages. After this, many scholars have come up with their own definitions for MaaS. For instance, Sonja (2014) refers to MaaS as "a system in which a comprehensive range of mobility services are provided to customers by mobility operators". Moreover, Kamargianni and Matyas (2017) define MaaS as an intelligent user oriented model for mobility distribution in which the offerings of the different SM providers are concentrated by a single mobility provider and supplied to users via one digital interface.

Hans Arby, a MaaS expert, states that the purpose of MaaS is to transform the cities' mobility environment by providing users with easy access to different and more convenient mobility alternatives. In addition, he mentions that in order to achieve this, the car ownership model has to be challenged (Brown 2021). Additionally, mobility organizations have also come up with their conceptualizations for MaaS. For instance, the International Association of Public Transport (2021) defines MaaS as "the integration of mobility services into one service/offer, including at least booking and payment (so not just information)". As shown previously, there are different existing MaaS definitions and for the purpose of this research the author finds it suitable to define MaaS as follows. MaaS can be defined as the consolidation of the different mobility services into one main offering that enables the user, at the minimum, to plan, book and pay for these mobility services.

2.3.2 MaaS Business Models

Furthermore, different MaaS pilots around the world have already been implemented, however further research should be conducted before the ambiguity around this concept disappears (Kamargianni & Matyas, 2017). Apart from aiming to reduce the use of private cars by providing more sustainable alternatives, the purpose of these pilots is to dimension the impacts of the new service to have a business case and if needed use it to justify government expenditure (UITP, 2021). In connection to this, a recent UITP knowledge brief report (2021) notes the importance of designing a viable MaaS BM to ensure that pilots transition into real services. Sarasini et al. (2017) support this and state that the key function of BMs is to generate and capture value, hence being able to determine an exact BM for MaaS would be optimal. However, due to the insufficient knowledge on the field this is still not possible. Nonetheless, recent research performed by Sarasini et al. (2017) has made it possible to identify some characteristics and ways in which MaaS BMs can create, provide and capture sustainable value.

According to Sarasini et al. (2017), the way in which MaaS BMs can generate sustainable value can be classified in three categories (1) mobility services, (2) data based services and (3) resource efficiency. First, MaaS BMs offer a range of mobility services which provide private value in the form of affordability, flexibility and convenience. At the same time, mobility services are environmentally friendly hence their use reduces the levels of congestion and emissions which generates public value (Sarasini et al., 2017). Second, among the benefits of database services there is the ability to plan trips, book and pay. This generates private value as users can identify the fastest and cheapest journeys. On a public value level, Sarasini et al. (2017) claim that database services allow real-time traffic management as well as better urban planning. Finally, MaaS solutions aim to be resource efficient by prioritizing green energy technologies and promoting material recirculation. This provides private value as it reduces mobility costs and reduces environmental impacts derived from car emissions and vehicle production, hence generating public value (Sarasini et al., 2017)

Additionally, recent work by Holmberg, Collado, Sarasini and Williander (2016) provide relevant insights regarding MaaS players and BMs that contribute to MaaS literature. MaaS players should stay updated about their surroundings by monitoring consumer behavior and keep track of new emerging technologies in order to capture sustainable value from them (Holmberg et al., 2016; Sarasini et al., 2017). At the same time, there is an evident need to conduct further research to comprehend and reap the benefits of exploring MaaS. Hence,

Holmberg et al. (2016) suggest investing in R & D highlighting areas such as societal factors, sustainability impacts and resource efficiency, policy integration and institutional perspectives. Furthermore, MaaS BMs should be built in a way that "they are technologically dynamic such that they facilitate the uptake of new environmental technologies over time" (Holmberg et al., 2016, p. 43), hence boost the development of new offerings. In connection to this, Holmberg et al. (2016) suggest traditional industry players such as auto-makers to start sensing and grasping the possibilities of the future by launching mobility services and simple car-owning schemes. Similarly, the authors highlight the need for MaaS players to step up their game and expand their offerings by providing monthly service subscriptions and re-packaging included services in order to offer flexibility.

Moreover, MaaS players need to keep an eye on their competitors, namely automobile manufacturers, in order to be one step ahead of them and hence come up with mobility solutions able to compete with the private car market (UITP, 2021). To achieve this, UITP suggests all mobility players to create alliances and encourages PT to get involved in these initiatives and if possible to take the partnerships building lead (Holmberg et al., 2016). UITP combined mobility experts constantly express their concerns regarding the possibility of an outside actor taking the lead of MaaS and explain that it might represent a big threat for the whole industry. Furthermore, one of the outcomes expected from further research on policy integration is the influence of MaaS players in urban planning and development which has the potential to transform not only the mobility industry but complete environments (Holmberg et al., 2016).

2.4. Preliminary Framework

After completing the literature review regarding BMI in the Mobility sector, three main theoretical pillars were identified: *Dynamic Capabilities, Business Models and MaaS.* The combination of these results is the basis of the preliminary framework which is subject to be developed through the empirical study.

Emerging technological trends are disrupting the way in which mobility is perceived and defined. These changes create environments in constant motion where shifts in users' needs and demands occur continuously (Deloitte, 2017). As a result, companies within the mobility industry should put efforts on understanding the rapid changes to quickly adapt and handle uncertainty (Kamargianni & Matyas, 2017). Additionally, for these firms to address this

dynamism and hence stay competitive they must consider the implementation of technological innovations (Teece et al., 2016).

The merger and application of technological solutions into the mobility industry has led to the emergence of MaaS (Arias & García, 2020). MaaS represents an opportunity that companies within the transportation and mobility field should not ignore. Therefore, in order for firms to succeed in the adoption and implementation of MaaS, they will likely have to change and adapt their BMs (World economic forum, 2021), perhaps fundamentally, to address the new ways of servicing mobility customers. Hence, the role of BMI is important as the design and constant refinement of sustainable BMs is essential to ensure MaaS survival and proliferation (UITP, 2021). BMI involves a change or adjustment in at least one or more of the following: offering, processes, resources and skills (Khanagha et al., 2014; Chesbrough, 2007). In order for organizations to well-manage these changes, the framework of DCs introduced by Teece (2007) and further modified by him and other academics can be applied. This framework suggests that the degree to which a company is able to dynamically adapt in times of change is directly related with their ability to Sense, Seize and Transform.

Hence, the main objective of this study is to understand the main barriers and potential solutions in connection with the capabilities of Sensing, Seizing and Transforming within firms. To elucidate this in a practical manner, this will particularly be applied into a MaaS context.
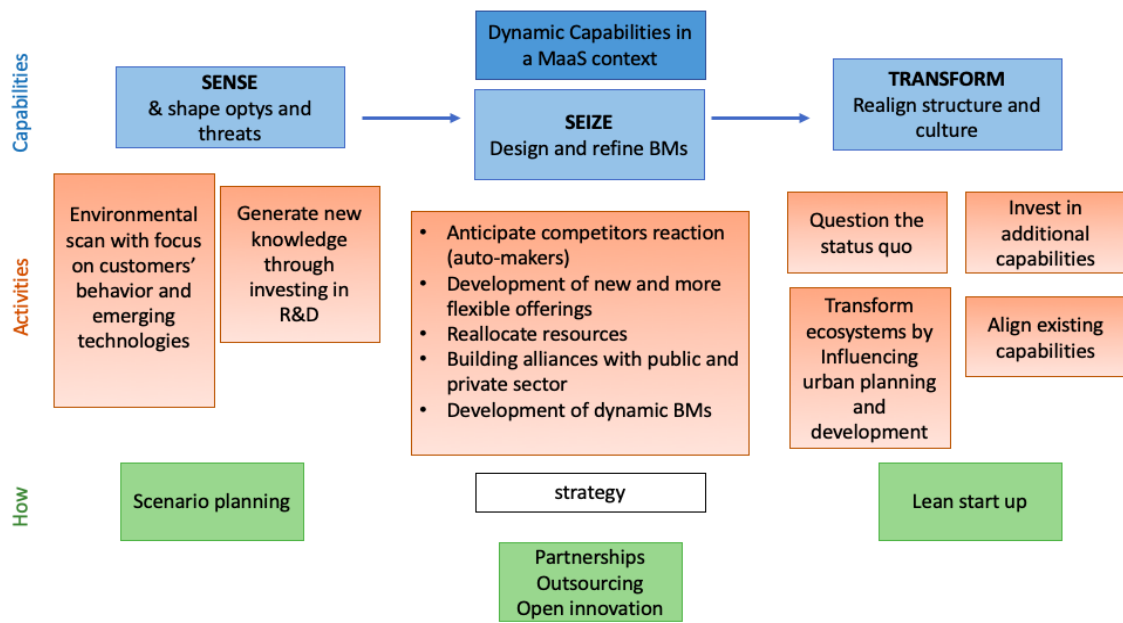
Figure 3: Preliminary framework of Dynamic Capabilities and Business Model Innovation Process in a MaaS context.

3 METHODOLOGY

The purpose of this section is to describe the selected methodology to perform this research. First, the research structure will be explained and further discussed. Followed by that, the selection of data sources, the data collection and data analysis processes will be outlined. Finally, a reflection on the reliability and validity of the data together with ethical considerations throughout the entire process will be provided.

3.1 Research Structure

As mentioned in the introduction chapter, this study intends to increase the understanding of BMI and illustrate its relation with DCs and key success factors to develop sustainable BMs. At the same time, it aims to expand current knowledge on how MaaS BMs are implemented and managed making use of alternative transportation modes rather than private vehicles and hence reduce traffic congestion. These objectives help shape the research questions of "How do mobility firms use DCs to tap into the mobility trends?" and "By doing this, do they also innovate their BMs?". In order to address such questions, this research aims to gather information based on individuals' perceptions and experiences within the mobility industry, particularly the one of MaaS. This will help expand theoretical and empirical knowledge on the role of DCs in firms engaged in a BMI process as a means to address emerging mobility trends.

As this study will not include any numerical data, a quantitative research approach is not ideal as it will not help in addressing the research questions. When the aim of the research is to explore to further understand humans' perception towards a certain phenomenon, Creswell and Creswell (2018) suggest qualitative research as a suitable approach. Moreover, this study aims to elucidate the role that DCs play for mobility firms aiming to better comprehend mobility trends as well as to identify key success factors for sustainable BMs within the field in times of change. In the same line, qualitative research intends to broaden the understanding of an issue by collecting many perspectives to identify key factors impacting a particular circumstance (Creswell & Creswell, 2018). Additionally, Creswell and Creswell (2018) claim that the research method selection should also be determined by the target audience. The purpose of this thesis is educational and the intended audience is expected to be stakeholders within the mobility industry as well as individuals interested in acquiring knowledge in the

field. With this in mind, conducting qualitative research based on the perceptions and experiences of industry experts seems to be a suitable approach.

Furthermore, since there is a clear necessity to build a deeper understanding of the problem, the research will be performed using an exploratory expert opinion method, which according to Iriste and Katane (2018) aids augmenting knowledge of the studied phenomena. The multi-expert opinion approach, also known as the expertise method, collects information based mainly on the opinion and judgment of qualified experts (Iriste & Katane, 2018). During this type of studies, the researcher gets the chance to gather and discover particularities of the studied issue, increase reliability of the data collected as well as increase the credibility of her own analysis and conclusions (Iriste & Katane, 2018).

In order to collect accurate and relevant data, it is crucial for the researcher to have a clear definition of the term expert. Meuser and Nagel (2009) define an expert as an open-minded person who has high knowledge and particular qualifications in a specific subject and hence is able to articulate better and with higher accuracy responses than an average individual. Iriste and Katane (2018) further argue that an expert can be considered a specialist who has practical knowledge and a solid theoretical background within the field of study, which allows him or her to examine, assess and forecast potential scenarios.

According to Bogner, Littig and Menz (2009), the expert opinion method is contemplated among the most popular and useful approaches as by interviewing experts, the researcher can obtain relevant first hand data which facilitates a more engaging and in depth analysis of it. Also, academics supporting the expertise method argue that it reduces the time the researcher has to spend collecting data, especially if there is the aim to acquire practical knowledge from emerging topics in which access to data might be limited (Bogner et al., 2009). Considering the fact of MaaS being such a fresh concept together with the time limitation previously mentioned, the researcher considers this method a suitable approach.

Moreover, Bogner et al. (2009) claim that supported by secondary data, this method enables the researcher to build hypotheses or predictions when needed. This ability becomes instrumental when decision making is needed, especially if decisions take place in an innovation context (Iriste & Katane, 2018). Therefore, this approach seems to be appropriate for this research as the subject under study is strongly linked with the innovation and

technological field. Additionally, with the intended audience being stakeholders within the mobility industry, the collected information can serve as a guide for their forthcoming decision making process.

Furthermore, Mills, Durepos, and Wiebe (2010) state that the researcher's ability to compare and categorize across a set of diverse contexts leads to more solid results than those that would otherwise have been obtained from a single case study for example. This approach will enable the researcher to analyze in a more holistic way as while all experts belong to the same study field and industry, they might provide different perspectives based on the role that their organizations play in the mobility environment. For instance, they might be intermediaries, interface owners, means of transportation providers, researchers, etc. Mills et al. (2010) also argue that the ability to understand how different conditions affect an environment may lead to valuable findings. Having a broader context will help identify how the presence of DCs affect the way in which mobility trends are addressed and how MaaS BMs are implemented and managed. At the same time, it will aid outlining the key success factors that render MaaS BMs sustainable.

3.2 Data Sources

This study is performed based on primary and secondary data acquired from different sources such as urban mobility experts and transportation firms, particularly involved in the SM field. The experts from which primary information was obtained were selected based on their motivation and performance to engage in BMI processes in a MaaS context. Academic articles, industry and company reports were the main sources used to obtain secondary data.

3.3 Data Collection

Data collection was done by both the conduction of semi-structured expert interviews and through documentary research. The coming two sections will first explain the motivations and process of the interview selection and design. Afterwards the gathering of secondary data will be elucidated.

3.3.1 Primary Data Collection

The collection of primary data becomes a crucial factor when conducting qualitative research since it enables the researcher to get in depth insights obtained from a first-hand perspective

(Bell, Bryman & Harley, 2019). For this research the collection of primary information was done by performing expert interviews utilizing a semi structured format. The use of semi structured interviews was selected as it permits higher flexibility which apart from encompassing the intended topics may lead to additional and insightful inputs (Bell et al., 2019). According to Bell et al. (2019), expert semi structured interviews are considered a suitable approach when aiming to retrieve information from people that have been directly involved with the studied subject and problem and hence understand their behavior towards it.

In order to ensure the experts' competence as well as their relevance to the study's purpose a set of assessment criteria must be considered (Iriste & Katane, 2018). Thus, some of the criteria considered when carefully selecting experts were expertise background, location, current position, years of experience within the subject under study. Based on this, an extensive research using LinkedIn and Google as main sources was performed in order to identify potential interviewees. After this, with the aim to get several interviews an approximate number of 50 MaaS experts were contacted either via email address or direct LinkedIn message (See Appendix A). The result was six respondents showing their willingness to share their experiences, hence six interviews were programmed and conducted successfully. Selecting interviewees with a purpose rather than randomizing, according to Creswell and Creswell (2018) provides an integral perspective and makes the entire study more valuable.

The operationalization approach enables the researcher to gather data and be able to understand and measure phenomena that cannot be measured directly (Singh, 2015). Supported by this approach, a set of open questions was generated prior to the interviews (See Appendix B). This questionnaire emerged from the selected literature review as well as the collected data acquired through desk research. Each question was thoughtfully developed with the objective of contributing to address the purpose of the study as well as answering the research question, which go hand in hand. The same list of questions was used for all interviewees. However, some iterations were made after transcribing and analyzing the responses from the first few interviews which resulted in the final questionnaire (See Appendix C). This with the purpose of incorporating additional insights drawn that were considered relevant for the study.

The length of each semi structured interview initially intended to be of approximately 30 - 40 minutes. Nevertheless, the exploratory nature of the interview and its open format together with the level of explicitness each respondent showed led to interviews lasting between 30 and 60

minutes. Moreover, the most convenient hence selected format was video call using the platforms of Zoom and Teams. The utilized data recording procedure was video recording supported by brief digital note-taking as a backup in case any inconvenience with the recording arises, as suggested by Creswell and Creswell (2018). Afterwards, interviews were transcribed with the use of Otter, a digital automated audio transcription software. Having the transcripts was quite useful as it allowed the researcher to revisit the collected data at any moment, contributing to a better analysis.

Moreover, when determining the number of experts to interview, Hunziker and Blankenagel (2021) state that there is not an ideal nor precise number of cases or subjects as "it always depends on the research question, the resources, and the accessibility" (Hunziker & Blankenagel, 2021, p. 172). After conducting six interviews, the researcher claimed to have met the saturation point. In qualitative research, saturation refers to the moment when the researcher stops gathering more information as she believes new data will no longer add value to the research (Creswell & Creswell, 2018). This conclusion was based on the fact that the researcher sensed optimism and believed the acquired data will suffice the purpose of the study. Although, she is aware that interviewing more people could have led to additional insights but due to time constraint this was not possible.

No.	Interviewee	Position	Field of expertise	Interview date	Duration (minutes)
1	A	Mobility Solutions Director	Smart Mobility, Urban Mobility, MaaS, Shared Mobility	April 2022	51:02
2	B	Urban Mobility Strategist	Shared Mobility, Electric Vehicles, Mobility Management	April 2022	37:05
3	C	Mobility Solutions Specialist	SaaS, MaaS, e-Commerce	April 2022	55:26
4	D	Senior Associate Smart Mobility	Sustainable Mobility, Urban form and travel behavior, Shared Mobility	April 2022	36:10

5	E	Urban Mobility Business Manager	Innovation, IT solutions, Smart Mobility, MaaS	May 2022	32:16
6	F	Transformation Mobility Manager	Smart Mobility transformation, MaaS, Sustainable Mobility	May 2022	53:02

Figure 4. List of interviewees

3.3.2 Secondary Data Collection

When performing qualitative research, Creswell and Creswell (2018) suggest to include multiple and diverse information sources apart from interviews such as company reports and academic articles. Following this guidance, secondary desk research was conducted to support and complement primary data. The secondary information was mainly gathered from open access sources regarding the topics of BMI, DCs and MaaS. The material was found through different well-known platforms including Google Scholar, Lund University Library, Scopus and ScienceDirect. Consultancy firm reports, literature articles, journal papers, company websites among others represent the main forms of the used information. Moreover, to perform an efficient search the use of keywords was applied, namely BMs, change, DCs, innovation, transformation, SM, urban mobility, MaaS. The collection of secondary data enables a more holistic analysis of the studied subject and provides more accuracy when elaborating hypotheses as well as conclusions (Creswell & Creswell, 2018).

3.4 Data Analysis

In order to give sense and purpose to the collected data, a proper and in depth data analysis must be conducted (Creswell & Creswell, 2018; Bell et al., 2019). The data analysis process started with organizing the different empirical data collected from the interviews and classifying it by format type, for instance video, audio, written. Subsequently, the primary data was transcribed with the use of the Otter software as mentioned previously. This enabled the researcher to have the data structured and handy to analyze it and further utilize it for different study purposes such as creating comparisons and the use of citations. Moreover, the transcribed material was carefully revised to ensure sense making and detect, if any, software errors that could lead to misinterpretations.

Followed by this, a coding and segmentation process took place by filtering and classifying the different data with the use of representative words for each predefined category (Rossman & Rallis, 2012). Since DCs were the main factor to analyze, the data was categorized depending on the activity it belonged to, hence sense, seize and transform were the codes used. After this, a description of these categories was elaborated to find interconnections between them to articulate the narrative (Creswell & Creswell, 2018).

Furthermore, a comparison of the classified data within each category was performed separately. The idea behind was to identify similarities to ensure data classification was performed correctly. This also enabled the possibility to identify any data that may have fallen into a wrong category to further allocated in the corresponding one and ensure accuracy. Once this process was completed, primary data was compared and contrasted with the one acquired through desk research as well as with the preliminary framework provided in chapter 2. The intention was to identify whether there was a mismatch between literature and empirical data or not. If none, the preliminary framework will have been proven to be correct and hence become the final. If any discrepancies were encountered, the development of a new framework would be required which would further result in the final one.

3.5 Reliability and Validity

Despite discoveries happening during the research process, Creswell and Creswell (2018) highlight the importance of using validation processes in order to convey credibility and accuracy of the findings. Hence, reliability and validity become crucial aspects of any research method. In qualitative research Bryman (2008) refers to validity as the "integrity of the conclusions that are generated from a piece of research", i.e. the correct relation between the information and conclusions drawn from the analysis. Additionally, validity involves the ability to transfer and apply the generated knowledge beyond the studied context (Bryman, 2008). In that sense, this research followed the criteria of validity based on Glaser's (1978) approach which is based on integration, relative explanatory power and practical and scientific relevance. Integration refers to the interconnection between theory and formulations. Relevance elucidates the degree of practical and scientific utility of the results derived from a study (Glaser, 1978). Moreover, reliability entails the consistency applied during the whole research structure (Creswell & Creswell, 2018).

During this study, different validity strategies have been performed to build trust worthy and solid findings. First, once the first final draft was completed, member checking was applied. This to ensure that the primary data source, interviewees, went through it and based on the major findings shared their comments and sense of accuracy (Creswell & Creswell, 2018). Second, negative or contradictory data, if any, has been presented and further discussed under a separate section. According to Creswell and Creswell (2018), doing this builds additional credibility as it makes the study more realistic. At the end of the day life is composed of different and sometimes conflicting perspectives, hence presenting them adds validity (Creswell & Creswell, 2018).

Moreover, to avoid subjectivity towards the research, the use of peer debriefing was applied to uncover potential biases as suggested by Creswell and Creswell (2018). In this case, the peer debriefing was present in the following two manners. First, throughout the whole research process several supervision meetings took place. The supervisor functioned as a debriefer that while familiarized with the topic on a broad level, had a totally different background than the researcher and was not part of the research process. This allowed an impartial and independent perspective towards the studied subject and findings. Second, a mid-seminar in which an external person reviewed and gave feedback regarding the first thesis draft and progress was performed. Both forms aided in providing a more objective assessment to the entire project.

Additionally, to ensure reliability the researcher took the time to review every transcription to verify that none of them had errors that could lead to misinterpretations. Whilst it is a simple approach, it adds value as it prevents confusions and enables affirmation of primary data collection (Creswell & Creswell, 2018). Another supportive tool implemented to increase reliability was the qualitative code book presented by Creswell and Creswell (2018). Following this 8-step procedure, enabled the researcher to properly perform data codification hence enhancing accuracy during this process. It is essential to put effort into building validity and reliability during a research process, especially when working with qualitative data since the results are based on the researcher's different interpretations (Creswell & Creswell, 2018).

3.6 Ethical Considerations

Ethical considerations were taken into account throughout the whole study. Bell et al. (2019) suggest three ethical principles to ensure the incorporation of ethics during the process of

primary data collection. First, *avoidance of harm* was achieved during the interview process by using language and dialogues that motivated a safe and harmonic environment for both researcher and interviewee. Second, *informed consent* was obtained by providing each participant with a description of the interview process which included mentioning the purpose of the study, their expected contributions and interview structure details (e.g. number of questions and expected length). Additionally, participants were informed about the intention to record the interviews and asked for their consentient. Finally, the *privacy* principle was elucidated by explaining to each interviewee how the retrieved information was going to be used together with the confirmation to respect privacy and anonymity.

4 EMPIRICAL DATA

This chapter has the purpose to provide a description of the studied industry in order to provide context and enhance the comprehension of the atmosphere in which MaaS implementation takes place. Moving forward, the background of the selected experts will be presented and the empirical findings obtained from the six semi structured expert interviews conducted will be outlined. Subsequently, with the support of secondary data collected previously during the desk research, the primary data will be analyzed. This analysis will be performed based on the preliminary framework presented on section 2.4. For the same purpose, affirmations and insights derived from interviews will be classified according to the DCs of sensing, seizing and transforming. The use of the framework as well as the categorization will serve to answer the research questions.

RQ1: How do mobility firms use DCs to tap into the mobility trends?
RQ2: By doing this, do they also innovate their BMs?

4.1 Sensing

This section will present the empirical findings extracted from the semi structured interviews regarding the different actions that companies take in relation to sensing and shaping opportunities and threats in their surroundings. Empirical findings have been ordered in the categories of generation of new knowledge, identifying opportunities and identifying challenges.

4.1.1 Generation of New Knowledge

R&D

Research and development activities enable mobility companies to stay on top of market trends by providing valuable insights that lead to the enhancement of current products and services as well as the development of new ones. This implies that the business growth depends to a large extent on the R&D department efforts (Interviewee A; Interviewee E; Interviewee F). Throughout the different interviews most of the experts express that R & D duties are a big part of mobility companies' strategies as these represent a strong source of knowledge which provides competitive advantage (Interviewee A; Interviewee B; Interviewee E; Interviewee F). Interviewee B mentions "[the]world is constantly changing and competition is increasing, which makes the R&D investments a must". R&D allows mobility companies to better allocate

their innovation efforts and hence improve their processes as well as their offerings (Interviewee B; Interviewee E; Interviewee F). In addition, research enables the performance of environmental screening techniques that aid on identifying emerging technological trends (Interviewee A; Interviewee B). Being able to outline emerging technologies and their potential application within a mobility context represents a major benefit for the industry players (Interviewee E). This identification becomes of high value as "investment decisions are usually made based on these [research findings]" (Interviewee A).

Furthermore, Interviewee E highlights the importance of having an R & D budget in place not only in large firms but for any company that aims to stay competitive. The knowledge acquired from R&D brings essential insights that help address "the questions what, who, where, when of a customer analysis and in the end this is important as before investing on an idea we want to understand our consumer" (Interviewee F). Along the same lines, Interviewee B states that the success of almost any innovation depends to a large extent on how well and rational its feasibility has been questioned beforehand. The same expert further mentions the importance of asking "is there a real market for this?" and if the answer is positive, "are these [market] needs already been addressed by anyone?". In connection to this, Interviewee F argues that a potential reason for why there has not been many successful MaaS implementations yet could be attributed to the lack of R&D investments. "Many of these [MaaS] pilots have not collected any data in advance nor after the implementation, which is very weird and makes no sense to me" (Interviewee F).

Training
With the aim to stay updated in terms of knowledge and skills required to stay on top of the industry, training is considered by many experts a fundamental pillar of their strategy. Some of the interviewed experts express the fact that they are constantly engaged in different types of formal training which enhance and help them develop capabilities to better understand their environment and be able to grasp upcoming opportunities (Interviewee C; Interviewee D; Interviewee F). One of the interviewed experts mentions that as part of their training activities there is the attendance to an annual global mobility conference in which participants get to interact with a wide range of international mobility stakeholders. Moreover, Interviewee B states "they [the organization] encourage us to once a year get enrolled as attendants in two [training] sessions and as facilitators in at least one".

Furthermore, Interviewee F indicates that a valuable and complementary activity to his current role is the participation as lead trainer instructor on MaaS seminars for UITP (International Association for Public Transport authorities). The same expert further states that this activity, which is directed to cities as well as public and private transport companies, aids to keep an eye on and sense what is going on around the industry. Along the same lines, another expert comment "we collaborate with different transport actors that are interested or have been involved in MaaS pilots…the centric goal [is to] try to track positive effects of MaaS management… this is done at least once or twice a year" (Interviewee C). The experts that identify training as an important activity to grasp opportunities also express the importance of constantly sensing shifts in skills as these are "crucial to dynamically respond to changes in the environment" (Interviewee F). Another expert further mentions that "these activities [trainings] motivate the continuous learning approach within the organization and towards the [MaaS] fresh concept" (Interviewee D).

Communication

During the conducted interviews, communication also stands out as one of the key assets to sense and shape opportunities within the mobility sector. Various interviewees coincide with the idea that frequent contact with the different stakeholders tremendously serves "to discern new ideas and opportunities" (Interviewee A). "For us [the company] consumers are perceived as key collaborators when developing and implementing projects…when the MaaS pilot concluded, consumers' insights helped build our report of lessons learnt and potential improvements" (Interviewee E). Moreover, Interviewee A comments that "sometimes they [customers] are the first ones to identify the application of new technologies and hence data collected from them is considered and evaluated".

Additionally, International conventions and seminars mentioned above also function as networking spaces where experts get to connect and exchange valuable knowledge. In line with this, Interviewee C states that "these places [the conferences] encourage the different mobility players to open up about the projects on which they are currently working…it builds a sense of trust which in turn provides a sense of community". Similarly, Interviewee D emphasizes the importance of networking and trust building as "MaaS is all about collaborating with the different players within the [mobility] sector and this is still a barrier that most of the pilots have faced". In connection to this, another interviewee expresses the need to better communicate that the concept and its BM aim to be sustainable and convenient for the different

parties involved. "Currently the lack of willingness to disclose data is evident as companies fear losing customers…communication and mutual collaboration are key elements for this" (Interviewee C).

Finally, internal communication was also mentioned by one of the experts. The interviewee highlighted the impact that effective communication regarding a strong innovative culture has on a firms' ability to predict upcoming market opportunities and hence gain competitiveness. "Managers across the different levels should function as spokespersons ensuring organizational identity connected with innovation is transmitted and embedded into employees (Interviewee E). The same expert further explains that "in this way their [workers] behavior will more likely lean towards constantly seeking new areas of innovation". Moreover, regarding the MaaS concept two of the interviewees argue about the power of influence of firms' decision makers and individuals involved in these projects to "be tenacious and firm regarding the potential of the [MaaS] idea" (Interviewee B). This internal action has claimed to be essential "to propel the concept and make others engage and have faith in it too" (Interviewee E).

4.1.2 Identifying Opportunities

Emerging Trends

Different experts note the importance of keeping track of emerging trends as these help as foreseeing strategic opportunities. The ability to identify emerging trends allows mobility firms to evaluate and target potential consumer segments and to some extent shape the rules of the unknown. For instance, one of the experts describes how e-scooters have impacted the mobility industry as "before they existed, sidewalks were built and used only by pedestrians" (Interviewee D). The same expert further mentions that it was only after the e-scooters were invented, that the responsible city authorities in conjunction with the respective mobility firm developed a set of regulations for e-scooters developers and users to follow.

Moreover, R&D also seems to be a key aspect that enables mobility firms to identify social and technological trends and hence allocate their investments as conveniently as possible (Interviewee A; Interviewee B; Interviewee E; Interviewee F). Through users' behavior analysis MaaS players have been able to identify emerging mobility trends to "compare and determine which mobility services are of high demand and how much people are willing to pay for each of them" (Interviewee B). For example, conducting in-depth studies of the emergence of e-scooters outlined that these are "the most profitable short distance travel mode…per

kilometer people are paying as much as they are paying for a car in free flow car sharing" (Interviewee F). Hence, different MaaS players have identified this particular service as an attractive opportunity to further exploit in order to boost their customer value proposition as well as to enhance their cost structure and revenue streams.

Economic Development

According to different mobility experts, studying and understanding rural and urban areas' evolution as well as the economic development enables them to plan and build future strategies. One of the experts mentions that "population will evidently continue to increase… same for the development and infrastructure in cities", which will result in "higher traffic congestion and users being forced to step out of their own vehicle and find alternatives". With this in mind, the need to provide more sustainable and convenient mobility services represents a great opportunity for mobility firms. Moreover, Interviewee A expresses the importance of predicting the future development of cities as in this way "mobility firms can be part of the urbanization planning processes and hence build their strategies accordingly". For instance, by MaaS players being able to influence future cities' infrastructure, the different mobility services will be able to function in their ideal ecosystem. Hence "users will find it more convenient to use them [mobility services] as the areas will be designed for these to be the primary means of transport" (Interviewee D), turning car ownership into the last option for them.

4.1.3 Identifying Challenges

Cost Structure

The different experts have expressed that while it is important to be proactive and perform activities to constantly sense what is going on out there, thinking rational and hence being aware about possible threats can help prepare in advance to tackle them. Cost structure appears to be one of the major challenges for the different MaaS players (Interviewee A; Interviewee B; Interviewee C; Interviewee D; Interviewee E; Interviewee F). One of the experts who was directly involved in the implementation of one of the first MaaS pilots in 2015 mentions "[the mobility industry] is characterized by, uhm, you have high asset costs". Likewise, Interviewee B states "I think cost structure can be the main problem…also the customer itself is not always willing to pay for a premium service". This occurs to be the case not only for MaaS projects but for any other related SM solutions, "whether you're running the private buses or public transport, or if you have car rental car sharing…it is a lot of investment and that is challenging" (Interviewee F). Along the same line, Interviewee C mentions "For the [MaaS] implementation

to happen, there are high fixed assets and the margins are very low… hardly anyone is profitable. If you look at public transport, it is 50% subsidized by taxes, so it is kind of a tough business".

Apart from the high and fixed costs outlined by some of the experts, two of the experts also express the need for high investment associated with the digital technologies, i.e. the platform development and maintenance. "So you need, you know, a couple of million to roll this [MaaS platform] out in countries…but in very large countries, maybe more than 10 million" (Interviewee C). Likewise, one of the experts who is currently working for a PT company mentions "whether it is [MaaS platform] built in house or outsourced, it is clear that financial support is needed so if there is no money there is no project".

Conservative Industry and User Preferences

The mobility industry is described by some of the interviewees as a very "traditional and conservative one…the [Mobility] market is very resistant hence their preferences remain old school" (Interviewee C). This appears to be a big barrier for mobility players as SM solutions such as MaaS have a hard time penetrating the markets, thus gaining customer acceptance represents a challenge. Moreover, the preference towards car ownership is still a dominant industry factor, which represents a threat for mobility players trying to provide alternative solutions. One of the experts states "we are always having our war against cars, the private owned cars, it is always in the bottom line…the flexibility and the freedom the private car offers is extremely and I almost want to say impossible to compete with". Likewise, one of the interviewees who is a former employee of one of the pioneer MaaS organizations stresses the difficulty of finding an "alternative that is as appealing as a car because the car more than anything to people reflects flexibility, freedom so they still prefer it".

Trying to build a rational perception towards the private vehicle costs also happens to be a challenge for mobility players as "it is very hard to get it in the minds of people how expensive a car actually is" (Interviewee A). Similarly, Interviewee C shares the fact that "[car ownership] is the second most expensive category after living for consumers" but they do not seem to realize it. The same expert further states that a car is an asset which is "super expensive" and that "depreciates super fast… so it is not a nice investment". Moreover, another expert express that costs derived from a car purchase are "more than just the purchase itself" as there are also "yearly costs of taxes… then of course maintenance when something breaks down,

gasoline…they [users] kind of forget it" (Interviewee B). Therefore, the resistance from users towards SM solutions such as MaaS might be attributed to the fact that "the whole [car ownership] cost system is quite complex to a consumer hence they never really calculate what it costs them" (Interviewee C).

Scalability

Scalability was frequently mentioned by experts as one of the main challenges of MaaS implementation and management due to the different factors and environments in which the application takes place (Interviewee A; Interviewee B; Interviewee D; Interviewee F). Whilst R&D efforts serve as a strong base to understand the market and hence build business strategies, Interviewee A states that "every situation is different depending on the context" which makes MaaS BM harder to scale. This also implies that "[MaaS BMs] are not easy to standardize" (Interviewee F) and one of the reasons is the fact that "partners will always be different depending on the region and city that the implementation occurs" (Interviewee A). Another factor that also impacts the MaaS feasibility to scale is that "service providers are afraid of losing market share" (Interviewee F) and hence prefer to work individually. As per different experts, cooperation is required to successfully implement and keep MaaS projects running (Interviewee A; Interviewee B; Interviewee C; Interviewee F).

Furthermore, two of the interviewees mention the fact that the few successful MaaS pilots appear to be "very reserved and do not disclose any numbers or data" (Interviewee B) which complicates the logical understanding of their success. By the same token, Interviewee A expresses that "they [service providers] need to be more open and understanding that we [mobility players] can compete together…and only together fulfill the different and particular consumer needs around the globe". In addition, collected data from the interviews shows that scalability is also impacted by local regulations, which go hand in hand with the inability to standardize processes and models across regions (Interviewee B; Interviewee C; Interviewee F). One of the experts argues that the integration between private and public sector is "by nature complex and even more so when we [MaaS players] have to constantly align to changes in regulations and different forms of government according to each location".

4.2 Seizing

This section aims to, based on the collected primary data, describe the identified activities performed by firms in regard to seizing and taking full advantage of the previously sensed opportunities. Empirical findings have been ordered in the categories of alliances, BMs and challenges of seizing.

4.2.1 Alliances

Alliances with Mobility Players

All the interviewed experts in some way or another mention the crucial role that alliances and collaborations play within a MaaS concept. Collaboration is described by one of the mobility experts as "one of the key success factors of MaaS". Mobility companies should create alliances and collaborate, for instance "MaaS projects rely on the collaboration from the cities, the developers, the public authorities, and the MSPs" (Interviewee B). Moreover, while partnering to work in one same project is important, other actions such as the "creation of mobility and innovation hubs where information sharing is part of the day to day activities" (Interviewee C) are essential. This implies that mobility players that might not be active participants of a particular project are still willing to contribute to it in different ways, for instance "opening up their data or sharing their concerns and ways to overcome them" (Interviewee C).

Collaboration with Research Centers

Collaboration with private and public research centers is an important part of MaaS pilots as these "provide high quality and reliable input that is useful especially during the innovation processes of a company" (Interviewee D). As mentioned previously, funding and cost structure is one major challenge for MaaS implementations. Research centers can generate information that is quite valuable for public and private institutions which can increase the chance to get the needed funding (Interviewee E). Moreover, experts appear to have different perceptions regarding the impact of research center collaborations. While some of them claim that data derived from research centers is the foundation for their BMs development (Interviewee A; Interviewee D), others perceive it as a complementary source that "serves as a data checking method" (Interviewee C). Additionally, one of the interviewees mentions that much of the data acquired from studies performed by research centers is further analyzed and supports the decision-making process regarding new investments.

Collaboration with Universities

Another type of collaboration that occurs to be common within the sector is the one with education institutions. Some of the experts mention the great role that research performed by selected universities plays for the mobility industry. Interviewee F states "this type of synergy benefits both parties as we get well elaborated works of the specific phenomena and they get our practical knowledge in form of seminars or congresses". Apart from this, interviewees describe the participation of young individuals to be "essential as they are sometimes the source of new ideas" (Interviewee D) and "help identify new ways in which technologies can be applied to a particular industry" (Interviewee F).

Partnerships for Market Penetration

During the conducted interviews, one of the topics mentioned in connection to customer acceptance was market penetration as a means to increase the market share. One of the experts that is currently working on a MaaS operator company states "to be able to penetrate the market and grow, we need to somehow get access to customers". The interviewee further mentions the importance of having customers' data for commercialization strategies, specially for the marketing purposes when launching a project. According to some interviewees, this data can be obtained by partnering with different organizations both public and private which have extensive customer databases (Interviewee A; Interviewee C). In this sense partnerships become a strong asset that aid in achieving profitable MaaS BMs as "otherwise the consumer acquisition has to be done using Google or Facebook, which is super expensive" (Interviewee C).

4.2.2 Business Models

Different experts state that the emergence of MaaS is expected to transform the mobility industry. In connection to this, data collected from interviews makes evident not only the potential of MaaS in revolutionizing the whole industry but also the already visible changes that mobility players are adapting when making MaaS part of their offerings. For instance, one of the interviewees expresses that MaaS BMs require the alliance of different stakeholders. This automatically represents an adjustment of the BM structure since the interaction with stakeholders has to be modified. "the BM of MaaS makes us rethink which are our key resources and partners…perhaps they used to be our competitors and now we consider their relationship essential to function" (Interviewee B). Similarly, experts note the need to

collaborate not only with mobility stakeholders but also partners from different sectors (Interviewee A; Interviewee B; Interviewee E). For example, "MaaS [also] implies the ability to pay for the service via platform so they [credit unions] should also be considered and integrated into our BMs" (Interviewee A).

Furthermore and as mentioned earlier, mobility experts state that the development and enhancement of MaaS BMs is to some extent driven by insights acquired from conducted research (Interviewee A; Interviewee D). "Research is crucial as it helps us to identify new revenue streams…this supports reevaluation of the distribution of resources and yes sometimes it leads to BMs alterations" (Interviewee A). Along the same line, Interviewee F who strongly believes in the future of MaaS encourages mobility service providers and MaaS operators to "think beyond conventional while designing their BMs and profit formulas". The expert provides further examples in relation to identifying new revenue streams such as the consideration of advertising in the platform and the offering users' database for analytics and further research purposes.

Lastly, due to the complexity of MaaS and the different factors involved, the need to adapt and refine the BM based on the context they are implemented appears to be of high relevance for the different experts. Interviewee A states that "every BM has to be adjusted depending on the context". The expert provides the example of a MaaS pilot that took place in China, where unlike other pilots, the platform provider and operator was a map application called Amap and not a MaaS expert operator nor a public institution. Similarly, another expert mentions that the reason why MaaS BMs are hard to standardize is due to the fact that partners tend to differ among regions, hence BMs require constant changes to sustain a local market fit.

4.2.3 Challenges of Seizing

Bureaucracy

One of the main challenges that MaaS experts highlight is the bureaucracy that takes place within organizations when trying to get on board in the implementation of a pilot. Different mobility experts associate bureaucracy with slowness and complexity in firms' decision making processes which represents a barrier when trying to "get the different parties involved and make things happen" (Interviewee A). Similarly, an expert who currently works for the PT sector recognizes the complexity of the environment and attributes it to the fact that "they

[public transport firms] have the attention of civilians, politicians and legislators, hence acting with caution is a priority".

Regulations

Regulations occur to also be a concern and blocker for the success of MaaS (Interviewee A; Interviewee C; Interviewee D). One of the interviewed experts who was part of a MaaS pilot that took place in Asia express: "The legislation did not allow us, for example, to provide banking for MSPs that are not included in the public offering" (Interviewee A). Another complication regarding laws and regulations that a MaaS expert expressed is the fact that regulations vary not only from region to region but also from one industry to another. This implies that in some cases "there might be both local and national regulations that the involved MaaS parties should stick to. This impacts the project's scalability even within the same nation [country]" (Interviewee C). Moreover, this has also been identified as one of the reasons why some organizations decide not to collaborate or join the MaaS pilots.

Resistance

Regardless of the industry, market resistance towards the unknown represents a common challenge that frontrunners must learn to handle (Interviewee C). As mentioned before, the mobility industry is described by different experts as a conservative one. This involves not only users' perception and response towards emerging mobility solutions but also the impact of well-established players in the market. For instance, some experts identify the automotive industry players as their strongest competitors (Interviewee B; Interviewee C; Interviewee F). Customers' resistance towards the mobility alternatives is "itself strong… mobility providers and operators have to collaborate to diminish it and not see each other as competition… we need to stay on top of auto-makers since they are our competition" (Interviewee B).

Additionally, resistance also appears to be present within current SM firms'. Interviewees claim that this resistance is derived from the fact that individuals and companies fear failure hence want to avoid as much uncertainty as possible (Interviewee A; Interviewee C). While some organizations "feel uncertain to participate in new projects as the outcomes are unknown" (Interviewee A), others per interviewee C express uncertainty towards "whether they are the right fit" for MaaS projects. Along the same line, MaaS operators argue that it is common for service providers to question everything around pilots before deciding whether to get on board or not. A MaaS operator interviewed by the researcher cites one of the service providers by

saying "so he said, I love the idea of MaaS, but, you know, we are a public transport organization, should we be doing this?". Hence, it is evident that the freshness of the MaaS concept results in resistance not only from a users' perspective but from important mobility players as well, which in the end is an important obstacle.

4.3 Transforming

Hereunder the actions undertaken by firms within the mobility regarding transformation will be outlined. Transforming activities include tasks that recombine, protect, adjust and restructure the firm's resources with the purpose of gaining and sustaining a competitive advantage. Empirical findings have been ordered in the categories of challenging the status quo and workforce ecosystem.

4.3.1 Challenging the Status Quo

Breaking Paradigms through an Innovation Culture

Some of the interviewed experts mention the importance of staying on top of the market trends to respond quickly to shifts in customers' preferences and needs. One of the interviewees states that mobility firms should be constantly monitoring not only what direct competitors do but also what other industries are working on, i.e. "where are they investing and which technologies are they targeting". In addition to staying up to date, this activity can serve as inspiration and spark curiosity to challenge current practices and strategies (Interviewee A). In connection to this, an R&D MaaS expert expressed the following: "for instance, by broadening our vision and analysis we might see the potential of Visa to become the next MaaS operator and not a current mobility player such as Uber or Didi".

Moreover, a top-level manager interviewed by the researcher describes that to constantly transform, the firm has embedded a "yes culture" in which different spaces and programs motivating employees to innovate and try new things have been designated. Furthermore, interviewees directly involved in MaaS research and implementation mention the "need to conduct pre, mid and post pilots research" (Interviewee F) as customer feedback represents "a valuable source to reshape strategies and innovate" (Interviewee A).

4.3.2 Workforce Ecosystem

Ensuring Diversity Prevails

Diversity within firms' employees is perceived by some experts as an important factor that impacts innovation processes and hence strategy transformation (Interviewee B; Interviewee C; Interviewee D; Interviewee F). Ensuring diversity is preserved among workers, helps transform the mobility ecosystem (Interviewee D; Interviewee E). For example, Interviewee E notes "we prioritize diversity as a core value since it has proven to unleash creativity" likewise Interviewee B claims that part of "having a friendly and healthy work environment comes from having a mixed workforce". The expert further elaborates and states that diversity in the "input, I mean employees" results in "radical innovations as outcome". Along the same lines, the different experts express that having a diverse workforce strengthens their ability to react and adapt to changes in the environment. This is due to the different abilities that "each individual possesses or is capable of developing" (Interviewee E), which enables firms to explore situations from different perspectives and come up with innovative solutions.

Investment in Skill Development

To ensure the survival of firms' by adapting to changes in markets and technologies, different interviewees expressed the importance of sensing skill shifts in the market to enable fast adaptation and agility. One way in which mobility companies seem to do this is by facilitating and encouraging constant training to employees (Interviewee B; Interviewee C; Interviewee D; Interviewee F). These trainings appear to enhance the development of capabilities needed not only to understand dynamic environments but to actually act and transform them (Interviewee B). Moreover, one interviewed MaaS expert expresses that while technical capabilities to develop digital platforms are an important part, cooperative capabilities are a thing firms should invest in. "In theory, anyone with IT skills could build a platform themselves and hence believe they can be a MaaS operator, but it takes more than that" (Interviewee C). Likewise, Interviewee B mentions that "it makes no sense to build everything yourself", the audacity to recognize "what we are good at and what we should designate to others" is key to stay agile.

Moreover, Interviewee E mentions the importance of reinforcing the capabilities of commitment and execution of plans since it is what leads organizational transformation. In addition, one of the interviewees who currently works for a PT company states "in these types of projects the ability of effective listening is crucial to interpret messages from users and experts". The same expert considers curiosity as an important skill as it is linked with the desire

of learning. "Be curious and if you do not know, listen to other experts and get inspiration" (Interviewee B).

5 ANALYSIS AND DISCUSSION

Chapter five aims to, based on empirical results, answer the RQs and highlight the main findings according to the study's purpose. This will be addressed by discussing and analyzing the empirical findings from chapter four in relation to the literature presented in chapter two. The main focus of this section resides in outlining relevant insights for each of the DCs categories; Sense, Seize, Transform. This approach will enable the examination of the preliminary framework, which was first created based on theoretical data. Consequently and in connection with primary data, the framework will be adjusted and a final version of it will be presented.

5.1 Sense

Teece (2007, p.1322) refers to the sensing and shaping of opportunities as "a scanning, creation, learning, and interpretive activity". In order for firms to develop a competitive advantage, they must outperform in these activities to detect emerging opportunities and threats before their competitors do (Teece, 2007). The following subsections include an analysis of the empirical findings in relation to the mentioned activities as well as the capabilities involved to perform them.

5.1.1 Environmental Scanning

As per Teece (2007), fast changing environments imply that customers' demands, competitors' performance and technologies are in constant motion which opens opportunities for both established firms and new entrants. In order for companies to sense these opportunities, a set of capabilities including generative sensing, sense making, scenario planning and real options purchase is required (Teece et al., 2016). Generative sensing involves a proactive approach to develop assumptions about "future implications of observed events and trends" (Teece et al., 2016, p.21) in order to test them and enable the forming of new products, services and BMs. The empirical findings support this as the different mobility experts express that performing constant research is essential as it aids to conduct environmental screening techniques to identify emerging technological trends.

Moreover, several interviewees coincide with the idea that frequent contact with the different stakeholders serves to have a better context of their surroundings and "to discern new ideas and opportunities" (Interviewee A). This goes in line with Teece et al. (2016) who argue about the

importance of staying in touch with customers and competitors to bring different perspectives to the process of developing new products and services as well as BMs. The authors further state that communication requires more than just listening to stakeholders as it demands time and networking to fully understand the foundation of customers' problems and hence address them. In connection to this, MaaS experts mention that consumers' input is perceived as a key success element. Hence mobility companies designate significant time to network to acquire insights that help enhance their understanding of their environment and factors that impact the performance of a MaaS pilot (Interviewee A; Interviewee E). Additionally, Interviewee A mentions that since customers are sometimes the first ones to detect new opportunities, data collected while networking with them is highly considered and carefully evaluated as it provides a first-hand environment context.

5.1.2 Generation of New Knowledge

By observing and performing research on consumers and competitor's behavior, firms can generate new knowledge (Teece, 2007). Different mobility experts express that knowledge acquired from R&D brings essential insights that help to better understand users' and competitors' behavior. Through performing customer analyses, mobility firms can answer fundamental questions that facilitate the understanding of the market and hence generate opportunities (Interviewee B). Moreover, while empirical findings highlight R&D as an important knowledge generator, a lack of an integral approach on R&D efforts is evident. The different interviewees affirm the performance of customer and emergent technology research and analysis. However, none of them include areas such as societal factors, sustainability impacts and resource efficiency, policy integration and institutional perspectives as Holmberg et al. (2016) suggest.

Furthermore, as per Teece (2007) the creation of opportunities requires access to data and the ability to identify and influence technological developments. Analysis of the mobility industry, particularly MaaS, outlines the evident need to improve data sharing best practices especially among service providers. Although mobility firms might possess the ability to create opportunities by identifying emergent technologies, the lack of willingness to disclose information among them might make it harder to shape these opportunities. Thus, instead of collaborating one with another, mobility firms are conducting their own research and practices. The researcher believes that this might be attributed to the fact that the MaaS concept is still fresh and since there are no big players yet, everyone is striving to gain a front runner position

hence refusing others to access their data. Hence, the researcher identifies that the DCF lacks explanation towards how firms can enhance data sharing practices with other companies to augment each other's competitive advantage without feeling exposed or threatened while doing so.

5.2 Seize

Teece (2007) defines seizing as the ability of companies to address the opportunities previously sensed through the coordination and allocation of the firm's resources. This according to Teece et al. (2016) can be achieved by the creation of new products and services and the adjustment in processes, logics and BMs. Below, empirical findings related to seizing will be discussed and compared with existing literature.

5.2.1 Resource Mobilization

According to Teece et al. (2016), resource allocation represents an important activity that helps firms to better grasp opportunities. Analysis of the mobility sector supports Teece's theory. Many of the experts mention the fact that for MaaS to be successful the need to reframe and rethink different aspects such as key resources is of high relevance (Interviewee A; Interviewee B). In addition, R&D appears to facilitate the identification of new revenue streams which supports the reevaluation of the distribution of resources (Interviewee A). Moreover, a key activity that firms must pursue to outperform while seizing opportunities is the coordination and alignment of both firms' resources and the ones of their partners (Teece, 2018). Empirical findings demonstrate that while MaaS players are aware of the need to coordinate and collaborate one with another and hence expand their resource base, the fear of losing market share prevails. Therefore, mobility firms should first be aware of this need, which seems to be the case already, in order to act accordingly and leverage the benefits that come with joining forces and resources (UITP, 2021).

Furthermore, theory elucidates the importance of firms to quickly adapt to changes in order to sustain a competitive advantage (Teece et al., 2017). One way for firms to pursue this is through licensing models or outsourcing the manufacturing since according to Teece et al. (2016), this enables quick access to a broader range of assets. One expert provides insights aligned to this by mentioning that his firm is currently working on identifying which resources are worth owning and which ones should be outsourced instead (Interviewee B).

5.2.2 Dynamic Business Models

According to Teece's DCF, during the seizing stage designing and refining BMs is essential for the success of an organization (Teece, 2007). The degree in which firms can capture value from technologies relies to a large extent on the viability of their BM (Teece, 2007; UITP 2021). Additionally, in firms where technology plays a centric role, BMs are seen as a tool that supports the development of technological innovations (Fallahi, 2017). Fallahi (2017) states that a proper BM analysis can enhance the understanding on why there are firms that are more capable of seizing value from a particular technology in comparison to others.

The data collected from Mobility experts reveals that the design of MaaS BMs is mainly driven by research conducted within the mobility industry for instance, analysis of customer and competitors' behavior and the study of new technology within the field. The scarce attention from mobility firms to analyze other sectors might be depriving them from identifying successful BMs within other industries from which they could get inspiration and develop a viable BM. Hence, the fact that mobility experts have not been able to determine an exact BM for MaaS (Sarasini et al., 2017) might be attributed to the previous empirical finding. Moreover, empirical analysis suggests that one potential reason why most of the mobility experts do not mention other industries' BMs as a reference might be due to the complexity of MaaS. During the interviewees, it was clear that MaaS implementation requires such a unique BM as it involves not only digital factors but also physical assets such as trains. Hence, mobility firms' might find it hard to even think of an existing scenario involving a BM that could potentially be transferable into a MaaS context.

According to Khanagha, Volberda, and Oshri (2014), BMI can range from an incremental adjustment or addition in a single BM component to a radical change of an existing BM implying the development of a completely new one. Analysis of the mobility industry demonstrates the presence of BMI and factors that lead to a change in BMs. For instance, experts explain that research enables firms to identify new revenue streams which consequently alters the profit formula of their BM (Interviewee B). In addition, the contextual aspect which varies from location to location is also considered a factor that forces MaaS players to constantly adjust their BMs (Interviewee A).

Furthermore, Holmberg et al. (2016) state that MaaS BMs should be built in a way that they are flexible and agile and hence facilitate the adoption of new technologies as they emerge. As

of today, empirical findings demonstrate that there is still not sufficient knowledge to define a specific MaaS BM. However, it is expected that data collected from ongoing pilots will make this possible. When this happens, mobility players must ensure that their BM are prepared to welcome new technologies and chance stay competitive. Likewise, mobility players must be aware that even when the identification of a MaaS successful BM occurs, the presence of BMI will continue to be crucial to change and enhance stakeholder's value proposition (Casadesus-Masanell and Zhu, 2013).

Furthermore, Teece (2018) states that a strategy that helps BMs to sustain a competitive advantage to quickly grow and develop is market anticipation which enables the seizing of big market share before competitors enter. By this, firms can leverage economies of scale advantages such as cost savings which makes their BMs more attractive (Teece, 2018). The MaaS analysis demonstrated that a major challenge is the BM cost structure and profitability (Interviewee A; Interviewee B; Interviewee C; Interviewee D; Interviewee E; Interviewee F).

While Teece's BM strategy might be of help for certain cases, it is clear that it cannot be applied to a MaaS context, implying that it is not generalizable. Even though MaaS players are trying to penetrate the markets by anticipating and innovating in their offerings, another barrier for MaaS BMs is scalability (Interviewee A; Interviewee B; Interviewee D; Interviewee F). Since MaaS BMs must be adjusted depending on the context they cannot be standardized, which complicates the seizing of large market share. Hence, it appears that MaaS players must find alternative ways to break down their cost structures and scalability obstacles. For instance, consider a section within the platform for companies to advertise their products and by this create a new revenue stream, which would also represent a BMI since the revenue stream scheme would be modified.

5.2.3 Alliances

Empirical findings demonstrated that strategic alliances are a strong determinant for the success of MaaS implementations. One of the interviewees refers to partnerships as "one of the key success factors of MaaS". One of the strategies that aid firms to sustain a competitive advantage is the creation of alliances with suppliers and competitors, which also contributes to having more flexible operational processes to quickly adapt to shifts in demand (Teece et al., 2016). Likewise, mobility experts express different ways in which alliances are of high value. For

instance, partnerships with prestigious universities to perform research on the field contributes to knowledge acquisition for both the mobility industry and education institutions.

On the one hand interviewees mention that the sharing of their practical knowledge with institutions provides valuable insights that are further utilized by researchers to guide their research efforts and render them purposeful. On the other hand, experts consider the involvement of young individuals essential as they are sometimes a strong source of new ideas which contributes to the identification of new ways in which technologies can be applied (Interviewee D; Interviewee F).

Another identified collaboration related to research is the one with research centers which provide reliable information and hence chances to get the needed funding from public and private institutions (Interviewee E). Although partnership practices are notable within the mobility industry, the analysis of empirical findings elucidates that these practices might be excluding the alliance with competitors, which according to Teece et al. (2016) is necessary for firms' success. Moreover, experts are aware of the need to collaborate with other mobility players including competitors as MaaS involves the inclusion of different mobility services. However, their fear to lose market share appears to be on a higher priority level which results in poor willingness to nourish these partnerships. Hence, one can argue that while partnering with competitors enhances value creation (Teece et al. 2016; Teece, 2006), further research and analysis considering factors inhibiting these collaborations should be performed.

Holmberg et al. (2016) state that for MaaS BMs to be viable and sustainable, alliances with local and national PT companies must be considered. Additionally, recent MaaS literature outlines PT as one of the most suitable players to lead MaaS implementation and the partnerships that it implies (UITP, 2021). Empirical findings within both the private and public mobility sector elucidate the desire from the different types of firms to lead MaaS projects. Regardless of what activity the firm performs (PT, software development, mobility services), it appears that the perception of losing market share results in companies trying to pursue full power and control or at least higher authority ranking.

Although private mobility companies might be great at quickly sensing opportunities, if investments are not performed in the right time, firms are likely to fail in transforming these opportunities into performance (Teece, 2007). Different MaaS players express concerns due the lack of funding. Hence, if mobility players are able to recognize and encourage PT

companies to take the lead the problem of funding might be resolved. This can lead to a great alliance where private companies contribute with the innovation and strategy side and public companies aid with favoring regulations and funding provision. If this is performed, MaaS BMs are likely to succeed and even expand.

5.3 Transform

Within Teece's DCF, the stage of transformation refers to the constant assessment of resources, business logics and BMs that result in the alteration of the organizational structure of a company (Teece et al., 2016). Teece (2007) describes this stage as the reconfiguration and recombination of assets and enterprise structures that bring the firm into a continuous renewal loop to stay competitive over times of change (Teece, 2007; Teece et al., 2016). The following sections will support a discussion of empirical findings related to transformation as well as a comparison with already existing theory.

5.3.1 Challenging the Status Quo

According to Teece et al. (2016), the transformation stage implies, among different things, questioning the status quo in order to break with conventional ways of thinking. To achieve this, Teece (2007; 2016; 2018) points out managers as the responsible for ensuring the mindset shift is well communicated and translated into action as well as to provide guidance towards the necessary change. When it comes to communication within private mobility firms interested in making MaaS successful, analysis of the empirical data appears to support the theory. Some mobility experts express awareness about the power that top level managers, who are in charge of decisions, must influence individuals in order to transmit the potential behind the MaaS concept (Interviewee B). Their influence, according to Interviewee E enhances the understanding and engagement which translates into motivated individuals working to achieve the same purpose in which they have faith.

Unlike this, managers from public mobility firms appear to be less diligent when it comes to communicating and transmitting engagement towards innovative ideas and the changes needed to bring them from paper to action. According to a PT expert, this happens due to bureaucracy and resistance as well as, in some cases, lack of commitment from internal individuals. Accordingly, analysis on this aspect finds stronger effective communication traits in private mobility companies where, according to a mobility expert, employees are constantly

encouraged and expected to challenge the status quo of things. When it comes to questioning and confronting the way in which firms operate, private sector experts outline the importance of innovation and R&D as a means to spark curiosity and find alternative ways to address customer needs. This empowerment and curiosity leads to motivated and committed workers aiming to achieve a common goal (Interviewee A), which results in firms' ability to better respond and adapt to changes (Teece et al., 2016).

5.3.2 Enhancement and Expansion of Capabilities

Transformation is required not only to sustain a market fit and hence a competitive advantage but also to stay away from path dependencies generated by routines (Teece, 2007). Path dependency appears to be a factor that inserts uncertainty to some mobility firms particularly the well-established ones, which reduces their willingness to participate in new projects (Interviewee C). In connection to this, analysis of the MaaS industry demonstrates that the freshness of the concept results in resistance from users, competitors and even from individuals working within firms aiming to lead and propel MaaS success (Interviewee A; Interviewee C; Interviewee F). Human resistance inhibits change (Teece et al., 2016), hence it is extremely important for firms to invest in and practice an organizational culture that enables flexibility and rapid adaptation (Teece, 2007; Teece et al., 2016). Empirical findings make evident that mobility firms consider crucial investments in R&D since it allows them to understand customers' needs as well as identifying where to allocate innovation efforts and by this improve their offerings (Interviewee B; Interviewee E; Interviewee F).

Another area that MaaS experts perceive as investment heavy is the development and maintenance of digital platforms. Likewise, the manufacture and maintenance of tangible assets such as trains. Nevertheless, analysis on mobility firms demonstrates an investment opportunity area which occurs to be overlooked, organizational culture. Only one of the interviewees expresses that as a means to constantly transform, the firm has embedded a "yes culture" in which different spaces and programs motivating employees to innovate and try new things have been designated. This resonates with what Teece et al. (2016) present as the lean startup methodology by which through experimentation a firm is able to rapidly test products, processes or BMs at an early development stage to either discard them or continue to invest in them. Hence in order to stay competitive, mobility firms must invest in building not only a strong organizational culture but also one that welcomes changes and is able to keep the pace of the dynamic environment in which we live nowadays.

Even when organizational culture was barely mentioned, empirical findings reveal that there is a strong and positive tendency towards investment in the constant enhancement and development of capabilities. Different interviews reflect a strong awareness towards the importance of sensing skill shifts in the market to enable fast adaptation and agility. Mobility experts happen to be constantly engaged in different types of formal training which fosters the development of skills to better understand their environment (Interviewee C; Interviewee D; Interviewee F). Throughout the interviews phase, different experts highlight a set of capabilities considered important assets for the industry growth and for MaaS pilots to succeed and eventually transition to real and permanent services.

Cooperative capabilities represent an important resource since according to experts "it makes no sense to build everything yourself". Hence the audacity of firms to recognize what they are good at and what they should assign to others is key to stay agile (Interviewee C). As previously mentioned, despite experts being aware of the importance to collaborate empirical findings outline cooperative capabilities absence. Therefore, mobility firms should not only be aware of this but act accordingly as well to efficiently manage and align resources with their allies in order to deliver higher value to customers (Teece, 2018). The capabilities of commitment and curiosity are also remarked by mobility experts as key success factors for MaaS projects (Interviewee B; Interviewee E). Experts link curiosity with the desire of learning, thus consider it important especially within a MaaS context where everything is new and dynamic which requires constant learning. Moreover, commitment is also highlighted as a key success factor that releases motivation in individuals and hence makes processes flow smoother.

5.3.3 Transform Ecosystems

Additionally, firms' organizational structure influences the degree of responsiveness and flexibility towards change (Teece, 2007). In connection to this, one of the challenges experts mention is the levels of bureaucracy that exist within mobility firms which inhibits the decision-making process. This particularly being the case of PT firms, where rigid and hierarchical organizational structures dominate as well as bureaucracy levels, hence complexity and slowness to respond to change prevails. The nature of the public sector places PT companies into a favored position to impact societies. Worth noting that having the ability to influence does not always mean having the willingness to do so. Due to this, recent reports of the UITP (2021) encourage PT firms to get involved in MaaS development and cooperate to facilitate

the implementation of it. With this in mind, empirical data suggests that to transform mobility ecosystems both PT and private mobility players should cooperate. The analysis of the mobility industry provides clarity regarding what private and public companies excel at.

On the one hand, private companies are great at innovating and in some cases the prioritization of diversity which unleashes creativity leads to radical changes with the potential to transform the industry. These are some characteristics that are needed to quickly assess changes due to the dynamics of environments (Teece, 2007; Teece et al., 2016). On the other hand, public sector companies aim to ensure a good standard of public services, accelerate economic growth and manage legal systems which are important traits that projects such as MaaS cannot overlook. However, due to their centralized structures adapting to change becomes a challenge for them (Teece et al., 2016; Teece, 2018).

Furthermore, another action that appears to have great potential to impact and transform ecosystems is the studying and understanding of the evolution of rural and urban areas. According to one MaaS expert, this enables mobility players to anticipate the development of the economy and the population growth, which represents a huge area of opportunity. By being able to predict the future of cities, mobility players can anticipate and build collaborations with urban planning authorities and organizations in order to be part of their strategies (Interviewee). The action of MaaS firms to influence policy integration is, according to Holmberg et al. (2016), expected to transform not only the mobility sector but the entire ecosystem.

5.4 Review of Analysis and Discussion

This section aims to provide a recap of the previous discussion and to review the preliminary framework shown in section 2.4. Based on the findings of the above analysis, the modification of the preliminary framework will be performed in order to build and introduce the final version of it.

The analysis and discussion above shows that the sensing stage relates to foreseeing opportunities and challenges that dominant emerging trends such as technological and social represent for firms. Within the mobility sector, sensing is mainly achieved through the performance of environmental scanning and the generation of new knowledge. This involves activities such as R&D and networking with stakeholders, which are of high importance as

these enable companies to understand the market and generate opportunities. Despite research being considered a key activity, mobility companies seem to limit R&D efforts to consumer and competitors' behavior. Therefore, to boost the foreseeing and comprehension of opportunities and challenges, it is suggested for companies to take a more holistic R&D approach by for instance including the study of societal factors, policy integration and institutional perspectives. Furthermore, individuals appear to be aware of how necessary the disclosure of information is. However, data sharing is identified as one thing that companies must improve to strengthen their ability to identify and influence technological developments, which is needed to achieve MaaS success. Therefore, the researcher claims the DCF lacks an explanation towards how firms can boost data sharing practices with other companies to augment each other's competitive advantage without feeling exposed or threatened while doing so.

When it comes to the seizing stage, analysis demonstrates that this is about being able to make things happen. Within mobility firms, seizing the previously sensed opportunities is present in the form of resource mobilization, design of dynamic BMs and the creation of strategic alliances. Resource reallocation implies not only redistribution of assets within an organization but also among partners which aids augmenting the resource base of a company and provides competitive advantage. Similar to data sharing practices this is something that mobility players know but do not practice due to the fear of losing market share. Hence, the researcher states that the DCF is deficient in explaining what approach can firms take to identify the required and missing resources to target strategic partners accordingly. Likewise, there is a lack of clarity regarding how to encourage firms to expand their resource base through partner collaboration while ensuring their competitive advantage is augmented or at least sustained.

Moreover, the design of a viable and dynamic BM is crucial for the success of a company as it elucidates how value is created and captured. Additionally, the analysis of BMs can support the understanding of how a company seizes value from a particular technology, the reason why competitors tend to conduct BMs analysis. The previous analysis identifies that the design of MaaS BMs is mainly driven by industry research, hence it is suggested to take a broader approach by analyzing other BMs industries to gather valuable insights that might result in the design of a viable MaaS BM. At the same time, it is apparent that MaaS is such a recent and unique concept that it is hard to even think of an already existing BM that could potentially be slightly modified and transferable into a MaaS context.

Furthermore, in a MaaS context BMI is inevitable since the contextual aspect, which varies from location to location, is a driving force that calls for constant BM change. This complicates the standardization of MaaS BMs hence compromises their scalability. Additionally, the analysis of MaaS BMs demonstrates that Teece's theory of anticipation and BM scalability to gain market share and competitive advantage cannot always be generalized. Therefore, this research encourages international mobility players to find alternative ways to collaborate to reduce burden in this aspect. Moreover, alliances are considered by MaaS experts as a key success factor. The analysis shows that partnerships with education institutions and research centers are dominant and fruitful whilst the alliance with competitors is of lower priority, almost avoided. Thus, it is important to find ways in which firms can leverage collaborations with competition while sustaining their own competitive advantage. Likewise, it is recommended for MaaS players to expand their horizons and break collaboration barriers to achieve integral success, which includes the participation of both private and PT institutions.

The transformation stage is about questioning conventional ways of doing things which implies the constant assessment of logics, BMs and resources to alter organizational structures and their ecosystems. Within the mobility sector transformation is done through challenging the status quo, expanding capabilities and influencing ecosystems' development. Analysis outlines the important role that top-level managers play in leading transformation within organizations. Managers' power to influence individuals is proven to impact the performance of MaaS implementations. Hence, it is suggested that mobility firms ensure that decision makers strongly believe in the potential of MaaS and its benefits in order to transmit and embed this to individuals. Moreover, while PT companies appear to be less enthusiastic when it comes to innovations it is evident that their participation is strongly needed to make MaaS happen. Therefore, pursuing collaboration between the public and private sector is appealing and crucial.

Furthermore, enhancement and expansion of capabilities seems to be an activity mobility firms have as a top of mind to stay competitive. However, as part of their efforts to stay competitive, building a strong culture that embraces change seems to be overlooked hence emphasis towards this aspect is suggested. Moreover, the study and understanding of industrialization and economic expansion appears to be a practice that must prevail among mobility industries. It has proven to enable the forecast of cities' development which mobility players can use to build

collaborations with urban planning authorities and organizations in order to be part of their strategies and shape environments.

After performing an in-depth analysis supported by both academic literature and empirical data, the researcher has been able to reflect and hence provides the following closing statements that leads to the development of a final research framework.

By looking at the DCF one may think that it is a sequential and linear model but it is not. Instead, the researcher claims that the model should be seen as a reciprocal model where things go back and forth and against each other. This means that one can look at one activity/approach within the framework and at that point and time it can belong to more than one of the DCs; sense, seize and transform since in the end, these are flitting things. Overall, sensing is about the ability to understand which requires cognitive capabilities. Transforming has to do with technical and practical capabilities as it demands firms to act. Lastly, seizing can be seen as a midpoint between sensing and transforming as it requires a little bit of both understanding and preparing to take action to eventually evolve.

The researcher suggests understanding the DCF as a constant evolution model which firms should leverage to enter a dynamic continuous enhancement of their capabilities. With the support of this model, firms are able to frequently assess their ability to sense, seize and transform according to changes happening in their surroundings. Hence, it is suggested that firms utilize the DCF and incorporate it as part of their day to day practices as it is not about a one-time transformation but a never ending one. By doing so, companies are expected to achieve and sustain market fit in order to stay competitive and ensure their long-term survival.

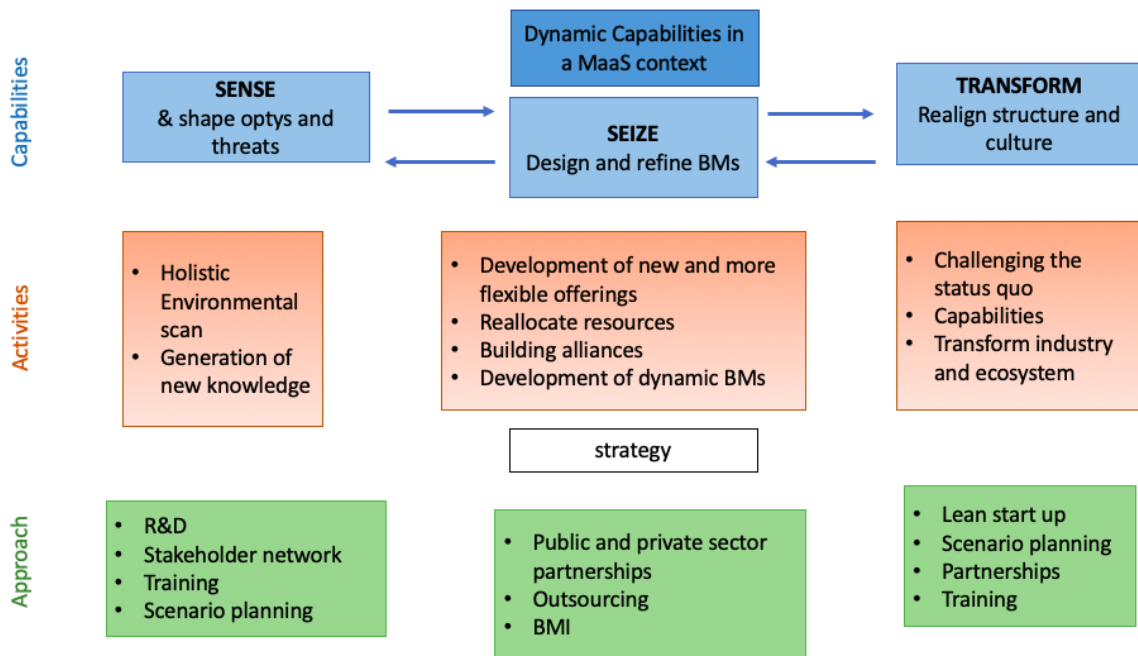|			
Capabilities	**SENSE** & shape optys and threats	**Dynamic Capabilities in a MaaS context** / **SEIZE** Design and refine BMs	**TRANSFORM** Realign structure and culture
Activities	• Holistic Environmental scan • Generation of new knowledge	• Development of new and more flexible offerings • Reallocate resources • Building alliances • Development of dynamic BMs / strategy	• Challenging the status quo • Capabilities • Transform industry and ecosystem
Approach	• R&D • Stakeholder network • Training • Scenario planning	• Public and private sector partnerships • Outsourcing • BMI	• Lean start up • Scenario planning • Partnerships • Training

Figure 5: Final framework

6 CONCLUSION

This final chapter provides a conclusion of the research. First, the purpose and contributions of the study are presented. Subsequently, following Glaser's approach the sections of integrity, explanatory capacity and relevance are presented. Finally, a section of future research recommendations regarding the potential of exploring new data and methods as well as the addition of new literature is provided.

6.1 Contribution

This research contributes to the understanding of how firms manage and leverage DCs in connection with the formation of new BMs. Within a business sector, particularly one involving technologies, this is of high relevance as the pace in which things emerge and evolve is dramatically accelerating and this tendency is expected to continue. Therefore, firms must understand this and prepare to quickly adapt to change and stay competitive. The idea of this research is to encourage organizations to always be one step ahead by utilizing the framework proactively to constantly address shifts in the environment instead of being reactive to them. Moreover, this research serves to expand existing knowledge of the MaaS concept that due to its newness appears to be scarce. The researcher has been able to identify specific challenges and opportunities that MaaS players are currently facing and thus findings are of high value for established and new entrant firms within the field.

6.2 Integrity

This study has used a deductive approach where theory was used as a starting point to develop assumptions. Consequently, the collection and analysis of empirical data enabled the testing of those assumptions. During this research, integration took place from the beginning since this study was based on an established and well recognized framework, the Dynamic Capabilities framework by Teece.

6.3 Relative Explanatory Capacity

The researcher claims that the final proposed framework, which aims to study the design and refinement of BMs in connection to the management of DCs, is better than other model alternatives since it has been built considering several factors. First, the researcher has spent considerable time reading and understanding different material regarding the DCF theory. This

enabled the development of an expanded version of the original DCF, shown at the end of section 2.2.3. Based on the different DCs works by Teece, the expanded DCF consolidates the activities and approaches that each of the DCs involve providing clarity and enabling a more in depth analysis. Second, this study uses diverse theories and academic articles which serve as foundation to build the preliminary framework shown in section 2.4. Moreover, the preliminary framework has been empirically tested hence the consideration of both theory and practicality enables a broader scope.

While other theoretical models might study more in depth a particular area, the proposed framework covers several theories and empirical testing which results in an integral approach elucidating more realistic scenarios. This is of high value and utility as in paper theories appear to be straightforward and crystal clear when in reality this is not always the case. Therefore, the final framework enables a closer look into the gap between theory and practical life in order to build connections that facilitate the understanding of certain phenomena that only with theory cannot be explained. Furthermore, the research results elucidate characteristics of organizations implementing servitization, which implies a mindset shift where continuous learning and refinement of BMs, logics and firm's structures is required. Additionally, this research demonstrates the complexity and barriers encountered when besides digital resources, an "as a service" offering is highly dependent on physical assets (e.g. trains, railway tracks, busses, e-scooters) such as MaaS.

6.4 Relevance

6.4.1 Practical Relevance

The researcher considers that the performed study provides practical relevance for the following reasons. First, from a business perspective, this research enhances the comprehension of some of the reasons behind the different actions that take place within an organization. In addition, this study supports the identification of where exactly within the value chain these actions occur. By having clarity of both why and where these activities take place managers and decision makers can easily identify a particular activity and determine its level of relevance in connection to the generation of value and hence take action accordingly. Second, this study emphasizes the importance of firms to take a proactive approach towards constantly performing and assessing the activities of sensing, seizing and transforming in order to boost their ability to adapt in rapidly changing environments where uncertainty governs. By

this, firms will enter into a never-ending evolution loop which will aid in sustaining their competitive advantage. Third, this research outlines different opportunities and challenges within the mobility industry, which highlights the need to conduct further research to find ways to leverage and overcome those opportunities and barriers accordingly. By this, the study also serves as a guidance for new entrants trying to gain a position within the already existing market as well as for both incumbents and new entrants aiming to explore and expand into new markets. Lastly, the study demonstrates the high potential that reinforcing and building collaborations within the field has hence it might serve as a strong call for mobility players to take actions accordingly to provide innovative solutions and stay competitive.

6.4.2 Scientific Relevance

The final model that this research proposes can be applied to conduct research in other settings and industries, implying that it can be considered to some extent generalizable. Given the nature of the selected research approach, qualitative, the author argues for the analytical generalizability of the results rather than a statistical one. Moreover, the researcher believes that while the framework may be more applicable to certain industries, the health care sector for instance, its applicability will be determined by the degree in which a certain industry is able to provide offerings in the form of services. This means that the model can serve to study servitization, i.e. businesses shifting their offerings from a one-off sale into outcome as a service.

6.5 Future Research

6.5.1 New Data

The current MaaS research has been performed based on the selected literature and the primary data collected from mobility experts mainly within Europe. The countries of residence and expertise include Sweden, Denmark, Germany, France and The Netherlands. Therefore, the author suggests conducting further research in other regions, for instance America or Asia. This recommendation is based on empirical observations that outline the fact that MaaS implementation and management is highly context dependent hence empirical results are expected to change considerably based on the location and time the research is conducted. In addition, studying alternative markets can help to better understand the emerging concept and the several factors impacting it. This can be translated into the identification of additional opportunity areas as well as barriers that current studies have not been able to identify either

due to the absence of these in current studied contexts or the scarcity of depth in existing research.

6.5.2 New Method

As mentioned in the methodology section, with the intention to explore how mobility firms use DCs to tap into the mobility trends and the impact this has into their BMs, the researcher has opted to pursue a qualitative research approach. This enhanced the understanding of the subject under study which enabled addressing the research gap. However, the researcher is aware that pursuing a quantitative study will bring valuable outcomes that can contribute to the current research. For instance, performing a quantitative study will enable the identification and quantification of the correlation between the activities performed under each of the DCs and BM change. For this reason, the researcher recommends to future researchers to conduct a quantitative research of the relationship among the three main concepts; MaaS, DCs and BMI.

6.5.3 New Theory

The researcher believes that the addition of theories such as Servitization, Digitalization, First Mover Advantage and Public Private Partnership into the theoretical framework can be of strong relevance. This recommendation is based on different empirical findings that shed light on the valuable outcomes that the study of these theories can bring. For further research in MaaS, the addition of the servitization theory appears to be important as it might aid in outlining specific traits of successful servitization BMs, which is still a challenge for MaaS BMs. Studying digitalization and the organizational activities that this involves can also support the development of a sustainable MaaS BM as well as the discovery of new ways to leverage technologies. Moreover, the consideration of a first mover advantage approach can aid understanding which type of mobility firm is more suitable to lead MaaS implementations. In addition, it can serve to outline the potential drawbacks of pioneering a market and the benefits of late entrants which may reduce the fear of market share loss and increase the willingness for mobility players to collaborate as a consequence. Finally, throughout the whole study Public Private Partnerships were identified as a crucial factor impacting the performance of MaaS, which calls for further and more in depth research of this particular and complex phenomena.

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APPENDIX

Appendix A

Hi (name of the expert),

I hope this email finds you well

My name is Claudette Kirnbauer and I am a MSc. International Strategic Management student at Lund University. I am currently writing my degree project entitled "Dynamic Capabilities in times of change: *A qualitative study exploring the role of Dynamic Capabilities and Business Model Innovation Process in a Smart Mobility sector context*".

The idea of the study is to collect empirical data from Smart Mobility and MaaS experts to get first hand in-depth insights on private and public transport challenges, driving forces, KSFs, etc. Moreover, the research aims to understand the role of Dynamic Capabilities and Business Model Innovation during a Smart Mobility/MaaS implementation project.

While performing some Linkedin research within the field, I came across your profile. For this reason, I would like to ask you if there is a possibility to have a brief zoom call (date and time to be determined based on your availability). I really believe your perspective and knowledge would be instrumental and very enriching for my work.

Thank you in advance, I am looking forward to hearing back from you.

Best regards,
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Claudette Kirnbauer
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0723874113

Expert interview questions:

1. Could you describe your position and the organization/company you work at?

2. How would you describe business model innovation?

3. Based on your experience, when would you say business model innovation is needed? What triggers this need?

4. What capabilities would you say are of high relevance when it comes to renewing a business model?

5. What would you say are the main challenges faced by mobility companies when trying to address emerging market needs and hence reconfigure their business models in order to stay competitive?

6. What experience do you have within the field of Mobility? and in MaaS specifically?

7. What are the motivating factors for you and/or the organization to participate in MaaS research/studies?

8. Based on experience, what would you say are the most important goals/impacts that MaaS pilots aim to achieve? Both short-term and long term?

9. Based on experience, what would you say are the main challenges faced by companies when implementing and managing MaaS Business Models?

10. What would say are the key success factors for a MaaS implementation?

11. Have you been directly involved on any MaaS Pilot? If so, can you tell a bit more about it?

Reviewed questions:

1. Could you describe your position and the organization/company you work at?

2. In general, which are the main mobility challenges today?

3. In general, which are the main challenges to Public Transport?

4. Driving forces of Smart Mobility?

5. Which actions do mobility players take to stay up to date and keep track of what is going on in their surroundings? In the short and long term?

6. Can you describe the innovation process within the firm you work for?

7. What does your workspace look like?
   - Would you say the set up and environment has an impact on your performance and the business as a whole?

8. In your experience of working/researching about MaaS projects:
   - Why do firms do it or try to do it? Objectives, short and long term?
   - What barriers are you facing?
   - Is there something that makes the MaaS business model hard to develop?
   - What are the KSFs and Capabilities needed?
   - What is the role of partnership with the different industry stakeholders? What are the benefits?
   - Do firms have to change their business models in order to achieve successful implementation of MaaS/Smart Mobility initiatives? If so, why and how?
   - What would you say is the impact that MaaS is having for the mobility industry?
   - Your take on MaaS in general? How do you see it? Crucial or too early?