THE DYNAMIC CAPABILITIES INVOLVED IN ECO-DISRUPTIVE BUSINESS MODEL INNOVATION

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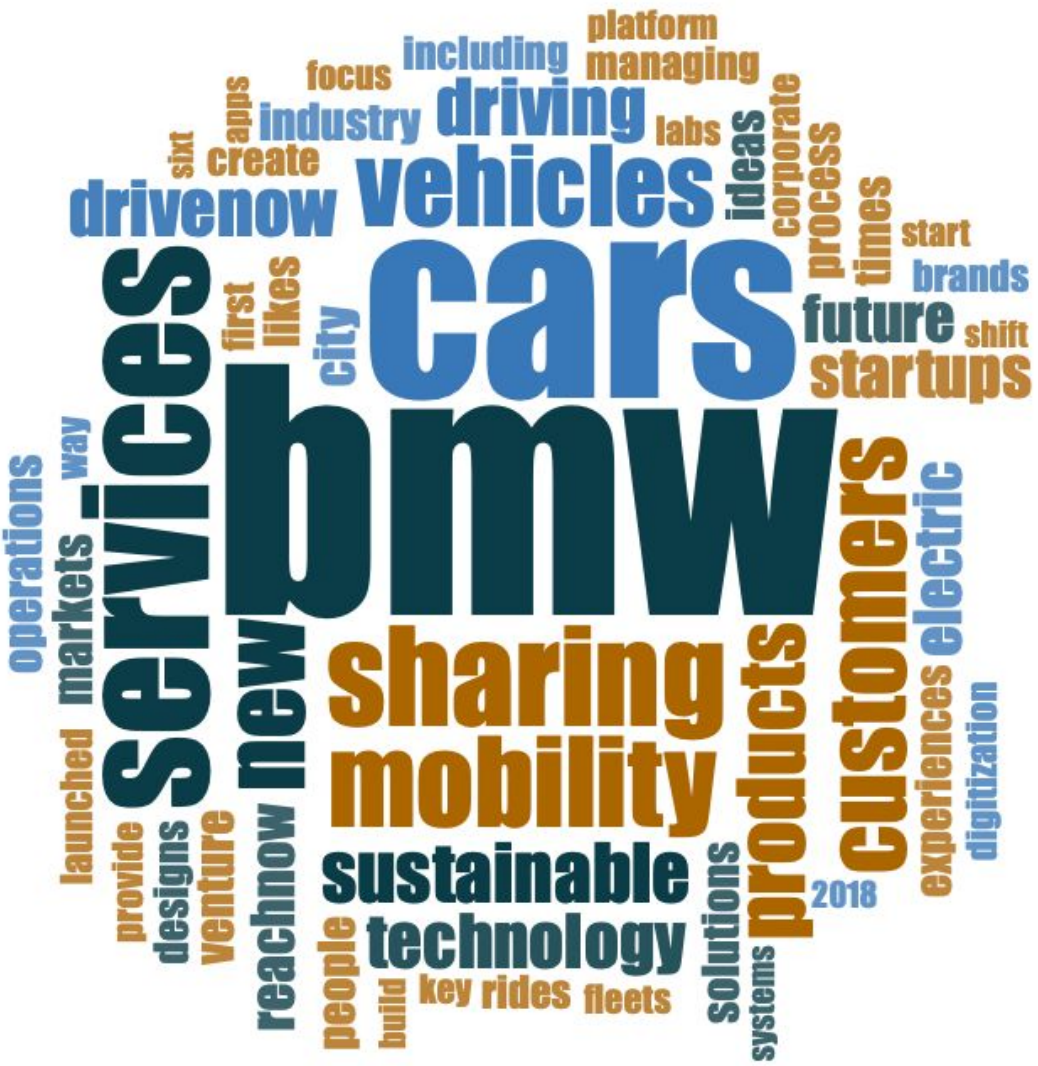
The Case of BMW's Adoption of Carsharing Business Models



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ABSTRACT

This thesis proposes a connection between disruptive innovation theory and eco-innovation theory by investigating the dynamic capabilities involved in eco-disruptive business model innovation. It does so by analyzing BMW's adoption of carsharing business models as a case for an incumbent company performing eco-disruptive business model innovation.

Dynamic capabilities, or a company's ability to adapt its resource base in response to changing economic environments, constitutes a prerequisite for business model innovation in both disruptive innovation theory and eco-innovation theory. As such, they are suggested as the link between the two theoretical perspectives. Consequently, two dynamic capabilities frameworks reflecting the two theoretical perspectives are applied to the case, demonstrating that neither sufficiently explains eco-disruptive business model innovation.

As a result, a new framework of dynamic capabilities that accurately describes eco-disruptive business model innovation is brought forth. This is done by discussing the case of BMW's adoption of carsharing business models. The resulting framework presents the dynamic capabilities involved in eco-disruptive innovation divided into sensing, seizing and reconfiguring capabilities in accordance with the dynamic capabilities taxonomy developed by Teece (2007). On top of that, it distinguishes between seven different stakeholders, namely (1) company, (2) employees, (3) suppliers, (4) customers, (5) public stakeholders, (6) startups, and (7) industry.

This thesis concludes by discussing the implications of this newly developed framework both from a theoretical perspective as well as a practical perspective.

Keywords: eco-disruptive innovation; disruption; sustainability; business model innovation; dynamic capabilities; stakeholder inclusion; carsharing; automotive industry.

TABLE OF CONTENT

1 INTRODUCTION

Innovation management has always been concerned with investigating the implications of innovation on established markets. Two streams of research that have attracted large-scale attention are disruptive innovation theory and eco-innovation theory. On the one hand, disruptive innovation theory, initially introduced by Clayton M. Christensen in his 1997 book 'The Innovator's Dilemma', describes the processes of how certain technological innovations can enter a market and become mainstream although initially delivering a lower performance in individual characteristics than the present products or services. Disruptive innovation theory has been highly successful within both academia and practitioners, inspiring a plethora of subsequent research while also entering everyday business jargon.

On the other hand, eco-innovation theory investigates the effects eco-innovation - i.e. any innovation that reduces the environmental impact of both production and consumption activities while sustaining economic returns (He, Miao, Wong & Lee, 2018) - can have on companies' operations as well as their competitive advantages.

Both streams of research are concerned with how certain types of innovation can affect companies. However, research has yet to consider innovation that shares the characteristics of both disruptive innovation as well as eco-innovation, i.e. eco-disruptive innovation. So far, no investigation into the effects of eco-disruptive innovation on companies has been conducted. This thesis aims at closing this gap by identifying an eco-disruptive innovation and investigating its effect on a specific case company. As such, it represents an effort not only to inform and advance existing research within the two theoretical fields but rather to recognize a common ground between them that might immediately prove valuable for practice while also having the potential to constitute a fruitful soil for future research.

One particular industry that might benefit from the investigation of eco-disruptive innovation is the automotive industry. For decades, the automotive industry has been subjugated by a static dominant design, namely internal combustion engine vehicles using carbon-based propulsion technologies that are sold to customers by the manufacturing companies. However, this is beginning to change with the introduction of innovative technologies, such as electric powertrains or autonomous driving systems, and innovative business models, such as carsharing, to the market. These innovations have the potential to disrupt the established

logic, while also having the potential to significantly decrease the environmental effects of both production and consumption activities in the industry. In other words, the automotive industry is facing high levels of potentially disruptive innovation as well as eco-innovation. Thus, an investigation of eco-disruptive innovation, or more specifically eco-disruptive business model innovation, can provide insights into dynamics highly relevant for an automotive industry currently facing major changes.

Combining the two theoretical fields required the identification of a commonly shared unit of analysis that allows for comparison. Consequently, this thesis begins with in-depth literature reviews of the two theories, which can be found in section 2. These made apparent that both theories emphasize the importance of business model innovation for companies in order to stay competitive when their economic environments are changing due to innovation (Cozzolino et al., 2018; Kiron et al., 2013). As a result, this thesis researches eco-disruptive business model innovation, or business model innovation in the light of eco-disruptive innovation.

Now that a common phenomenon has been identified, the unit of analysis stems from the research. Both disruptive innovation and eco-innovation theories, refer to the notion of dynamic capabilities (Inigo et al., 2017; Mezger, 2014) when faced with the question: how can companies innovate on their established business model?
Built on the resource-based view of the firm (Barney, 1991), a company's dynamic capabilities can be defined as a reflection of the company's ability to adapt its resource base in response to changing economic environments (Teece, 2007). They can be divided into sensing (i.e. the ability to sense opportunities and threats that present themselves in the market) seizing (i.e. the ability to make the right investment decisions), and reconfiguring (i.e. the ability to reconfigure its asset base in line with the developments of the market).

Due to the focus of the dynamic capabilities perspective on changing economic environments, it comes as no surprise that disruptive innovation theory and eco-innovation theory have both emphasized the importance of dynamic capabilities for business model innovation. This has led to both research streams spawning their own dynamic capabilities frameworks based upon Teece's (2007) taxonomy of sensing, seizing and reconfiguring.

For the purpose of this thesis, two frameworks have been identified and described in detail in section 3. On the one hand, the framework developed by Mezger (2014) presents an in-depth investigation of the dynamic capabilities involved in disruptive business model innovation. On the other hand, the framework developed by Inigo et al. (2017) presents an in-depth investigation of the dynamic capabilities needed for business model innovation for sustainability. Analyzing both frameworks demonstrated that the simple merging of the two might not be sufficient to explaining eco-disruptive business model innovation. In other words, understanding the dynamic capabilities involved in eco-disruptive business model innovation might require the development of a new framework, thus this thesis aims to test this proposition and if necessary develop a new framework to connect the two fields of research through Dynamic Capabilities. For this purpose the following question and subquestions were stipulated, utilizing the taxonomy of Teece (2007) for an easier comparison with previous research:

- How is a company able to innovate its business model (BM) when faced with eco-disruptive innovation?
    - What sensing, seizing, reconfiguring processes does a company need to implement for the business model innovation (BMI)?
    - How are these processes implemented?

A deductive research approach is chosen to test the theory with a case and adjust the theory in case of need. In particular, the two frameworks of Mezger (2014) and Inigo et al. (2017) are applied to a case of eco-disruptive business model innovation in order to gain insight into how the frameworks explain the case from their respective point of view.
In the analysis it will be found that the frameworks are not sufficient for explaining the case and, according to the deductive approach, the theories will be adjusted with the findings in order to build a new framework.

In order for the deductive approach to be feasible, an eco-disruptive business model innovation as well as a company adopting it need to be identified so that the existing frameworks can be tested. For this reason, this thesis analyzes the business model of

carsharing as a potentially eco-disruptive business model innovation as well as the company BMW as the innovator in the form of a case study. The justification for adopting a case study research strategy as well as the reasons for choosing BMW's adoption of carsharing business models are given in section 4.

In order to get first insights into the case, an interview with a key informant from within BMW is held. The informant is Marcus Krieg, at the time the Head of Mobility Services at the BMW Group and thus responsible for all types of mobility services (e.g. carsharing and ride hailing). The interview includes open ended questions about BMW's initial decision to adopt carsharing, the development of DriveNow, BMW's strategic vision for the automotive industry in the light of the potential paradigmatic shift towards shared, electric and autonomous mobility, and the recent merger of the mobility service business units with those of the Daimler AG. Conducting this interview provided the authors of this thesis with an in-depth understanding of the current dynamics within the automotive industry and BMW's role within them. It also provided an overview of the main capabilities required by BMW for the commercialization of carsharing business models.

These insights are subsequently used to inform the collection of data through the gathering of textual documentation. Analyzing the bulk of textual documents written over the last years about BMW's adoption of carsharing business models, provided the authors with a holistic overview of the processes and initiatives BMW used as well as the implications these processes and initiatives had. This is subsequently used as the basis for the analysis of this thesis, i.e. the application of the two established frameworks on the case.

The data was codified according to the taxonomies offered by the frameworks. In other words, the processes and initiatives are divided into sensing, seizing and reconfiguring and named sustainability, for Inigo et al.'s (2017) framework, and technology, for Mezger (2014) framework. This resulted in six distinct groups of dynamic capabilities, namely (1) sustainability sensing, (2) sustainability seizing, (3) sustainability reconfiguring, (4) technology sensing, (5) technology seizing, and (6) technology reconfiguring. Finally, the processes and initiatives BMW used for the adoption of carsharing business models are described for each group.

The analysis (i.e. section 5) compares the codified data to the frameworks and demonstrates that the two frameworks are insufficient for explaining BMW's adoption of casharing business models as both only account for a portion of the processes and do not fully explain the sinergies.

The implications of these findings are subsequently considered within the discussion of this thesis. First, the data and theory is used to discuss whether carsharing does in fact match the characteristics of eco-disruptive innovation, i.e. disruptive innovation and eco-innovation. It is found that this cannot yet be fully assessed due to the fact that the development of the business model is not concluded and no large-scale market adoption has yet happened. However, it is found that carsharing does possess all major characteristics of both disruptive innovation and eco-innovation. As such, it can be defined as potentially disruptive eco-innovation and a valid case for analysis.

Second, it is discussed how BMW actually implemented the processes described in the analysis through projects, ventures and collaborations. The focus of this section lies in explaining the relationships between the different projects, ventures and collaborations, how BMW was able to benefit from synergies between them and processes implemented to innovate on its business model.

The subsequent comparison of the analysis and the implementation of the processes by the case company is then used to derive a framework. This framework is built on the taxonomy of Teece (2007) and on the identification of seven different stakeholders: (1) company, (2) employees, (3) suppliers, (4) customers, (5) public stakeholders, (6) startups, and (7) industry.

Finally, the conclusion of this thesis (i.e. section 7) summarizes the findings and provides an overview of the developed frameworks theoretical as well as practical implications.

2 RESEARCH DOMAIN

How companies can sustain competitive advantages while their economic environments are changing is one of the fundamental questions in academic research. In recent years, the relevance of this question has, if anything, been growing. The web 2.0 and overall technological advancements have led to a plethora of new business models being introduced to all kinds of markets. On top of that, customers have become increasingly aware of the environmental repercussions of their consumption activities, with many demanding more sustainable offerings. These developments, paired with a tendency towards shorter product life cycles and an overall increase in the pace of innovation, have resulted in markets today being highly dynamic. Companies are required to change in accordance with their markets if they want to stay competitive in the long term. Thus, the question of how to do so is becoming more critical than ever.

This thesis looks at two particular streams of research concerned with this general question. On the one hand, research on disruptive innovation has emerged in recent years analyzing how new business models based upon technological innovation can enter a market and within a relatively short time evolve into mainstream solutions that can push established players out of the market if they fail to adapt. On the other hand, research on eco-innovation has analyzed how companies can innovate on their business models in order to reduce the environmental impact of their activities and thus align their offerings with the growing demands for sustainability among customers. The two research streams share many commonalities in that both are concerned with economic environments changing in specific ways and point towards business model innovation as a way for incumbents to adapt to these changes. However, research has yet to provide a consideration of eco-disruptive innovation, referring to innovation being introduced to a market that is both disruptive from the perspective of incumbents as well as aimed at sustainability. One case for such developments is the automotive industry, with the eco-disruptive innovation being the carsharing business model. The remainder of this section provides literature reviews of both research streams, namely disruptive innovation and eco-innovation. This in-depth understanding of the two theoretical perspectives is subsequently used to demonstrate the relevance of unifying them. Finally, a holistic overview of the automotive industry and its high potential as a case market is provided. The section concludes with this thesis' underlying research problem.

2.1 Literature Review of Disruptive Innovation Theory

The theory of disruptive innovation - as introduced by Christensen (1997) in his book 'The Innovator's Dilemma' - describes the process of how new entrants with fewer resources at their disposal can challenge the incumbents of an industry through employing disruptive innovations. (Christensen, McDonald, Altman & Palmer, 2018; Christensen, Raynor & McDonald, 2015)

The following section provides a holistic overview of the research on disruptive innovation published in the last two decades. In order to do so, research from a variety of different perspectives is included. However, the section concludes with specifically discussing research published on disruptive innovation in the automotive industry.

2.1.1 The Process of Disruption

Disruption constitutes a process that can be described as follows. Incumbents of a market are focused on sustaining innovation, referring to both incremental and radical improvements to their products and services for their most profitable and most demanding customer segments. As a result, the demands of less profitable customer segments tend to be ignored. Disruptive entrants enter the market by satisfying the demands of these neglected segments and are thus often either overlooked or underestimated by incumbents. Eventually, the disruptor further improves the performance of the disruptive innovation until it is attractive to the mainstream customer segments of the market as well. It is not necessary for the innovation to overcome the incumbent's product's performance; it is enough to overcome the expectations of the incumbent's market in some new dimensions of performance. Once the mainstream customer segments switch from the incumbent's products and adopt the disruptive innovation, the market has been disrupted. (Christensen et al., 2018; Christensen et al., 2015; Raynor, 2011)

Christensen argues that disruption can be classified into two different types depending on the market foothold it originates from. On the one hand, low-end disruption refers to companies entering the low-end of the market by offering a product that, while being less sophisticated than incumbents' products in terms of certain performance characteristics, excels in other characteristics such as ease-of-use or price. On the other hand, new-market disruption refers

companies employing disruptive innovation to create new markets in an effort to turn non-consumers into consumers. (Christensen et al., 2015)

Finally, Christensen et al. (2009) identified three factors enabling disruptive innovation, namely technology, business models and value networks. First, disruption can stem from technological advances aimed at simplifying the solution to problems. These can make products simpler and/or more affordable, thus enabling disruptive innovation. Second, disruptive innovations always requires some change to existing business models. As such, business models can act as an enabler of disruptive innovation. Finally, disruptive innovation also requires a fitting value network, i.e. a network of suppliers, service-companies and vendors that help in producing, marketing and selling the innovation. As a result, a value network can act as an enabler of disruptive innovation as well. (Christensen et al., 2009; Vriens & Søilen, 2014)

2.1.2 Critiques and Further Development of Disruptive Innovation Theory

The theory of disruptive innovation has been successful with both academia and practitioners. It has not only inspired a variety of subsequent research, but the concepts of disruption and disruptive innovation have entered everyday business jargon. However, the theory as developed by Christensen has been repeatedly criticized for failing to describe the dynamics of well-known innovations such as, for example, the Apple iPhone (Kumaraswamy, Garud & Ansari, 2018; Weeks, 2015). Christensen (2006) states that building disruptive innovation theory is an ongoing process in which these anomalies are a valuable asset. Yet, it has been argued that the predictive power of the theory is limited by the lack of a clear definition of the term 'disruptive innovation' (Danneels, 2004; Kumaraswamy et al., 2018; Nagy, Schuessler & Dubinsky, 2016; Vriens & Søilen, 2014; Weeks, 2015). This problem has been addressed by researchers in a number of ways.

First, in an effort to derive a clear definition of the term 'disruptive innovation', Nagy et al. (2016) investigated the intrinsic innovation characteristics as identified in the innovation adoption literature. These characteristics are: (1) functionality, (2) technical standards, and (3) ownership. The authors conclude by proposing that disruptive innovations can be defined

as “an innovation with radical functionality, discontinuous technical standards, and/or new forms of ownership that redefine marketplace expectations” (Nagy et al., 2016, p. 125). This definition reflects the characteristics established by Christensen (1997), particularly the fact that disruptive innovation usually builds on disruptive technologies. However, the definition by Nagy et al. (2016) is much more precise. This allows for a clear distinction of what constitutes a disruptive innovation and what does not. As this proves crucial for the analysis, the remainder of this thesis uses Nagy et al.’s definition.

Second, it has been argued that the two categories of disruption, namely low-end disruption and new-market disruption, simply do not represent some innovations (Weeks, 2015). As such, Vazquez Sampere (2016) has argued that disruption can originate from a third foothold, namely the high end of the market. This high-end disruption refers to a company entering the market with a product that is superior to the incumbents’ products and thus aimed at high-end customer segments.

Finally, Kumaraswamy et al. (2018) argued that the observed anomalies stem from disruptive innovation theory not incorporating a relational perspective. Building on Teece’s (1986) framework of complementary assets, the authors argue that innovators rely on other companies in the commercialization of their innovations. As such, introducing a disruptive innovation to the market has ramifications for the entire market ecosystem rather than only for specific incumbents. As acknowledged by Christensen (2006), the same innovation can be sustaining for some companies and disruptive for others. Thus, the entirety of these ramifications has to be considered when analyzing disruptive innovation.

2.1.3 The Challenges for Incumbents Entailed in Disruptive Innovation

Incumbents face a number of challenges in both identifying and responding to disruptive innovations, resulting in a decisive advantage for the disrupting new entrants. First, incumbents often fail to anticipate the threat posed by a disruptive innovation. This is due to the fact that, at the time of their introduction to the market, disruptive innovations often times perform worse on the product attributes the mainstream customer appreciates the most. As such they are not appealing to this customer segment but rather aimed at customer segments outside the mainstream or non-consumers. Incumbents, on the other hand, are strongly reliant

on their mainstream customer segment and, consequently, focus their attention on them. The emerging or niche segments disruptive innovation is initially aimed at are often times insignificant for their survival. As a result, disruptive innovation are often times underestimated and neglected. (Christensen, 1997; Christensen et al., 2018; Christensen et al., 2015; Cozzolino, Verona & Rothaermel, 2018; Govindarajan & Kopalle; 2006; Vriens & Søilen, 2014)

A second challenge incumbents face is that disruptive innovations are often financially unappealing to them. On the one hand, the initial markets for these disruptive innovations are too small for the incumbent's growth needs. On top of that, the future demand for the innovations is hard to anticipate ex ante, as it is uncertain whether the mainstream customers will adopt the innovation and how big the eventual market will be. On the other hand, adopting disruptive innovations represents an organizational discontinuity for the incumbent as the inherent "ways of creating and capturing value [...] dramatically deviate from the traditional innovation trajectory" (Kammerlander, König & Richards, 2018, p. 1122) and are thus not aligned with existing business models (Kumaraswamy et al., 2018). These new organizational demands impede the implementation of disruptive innovations as they require incumbents to overcome the rigidity of existing routines and zero-level capabilities. In summary, adopting disruptive innovations frequently entails both a high financial risk and a high amount of necessary internal reconfiguration, which is why it is often financially unappealing for incumbents. (Cozzolino et al., 2018; Ho & Chen, 2018; Kammerlander et al., 2018; Karimi & Walter, 2015)

Finally, incumbents are faced with the 'innovator's dilemma', meaning that even if they would be able to offer a comparable innovation of equal value to their customers, this innovation would cannibalize its existing profitable offerings. According to resource dependency theory, an organization can only act in a way that is consistent with the demands of the outside actors they depend on for resources. These actors, e.g. customers and investors, are understandably reluctant to the idea of cannibalizing the sources of the organization's profits, impeding the organization's ability to disrupt itself. (Christensen, 1997; Christensen et al., 2018; Christensen et al., 2015; Cozzolino et al., 2018; Kumaraswamy et al., 2018; Sandström, Magnusson & Jörnmark, 2009)

2.1.4 Identification of and Strategic Responses to Disruptive Innovation

Despite the aforementioned challenges incumbents face in the light of disruptive innovation, researchers have proposed a wide array of strategies for incumbents to both identify disruptive innovation and respond successfully.

Incumbents can identify disruptive innovations in a number of ways. First, they can examine whether there are internal disagreements over the development of technologies and products. Incertitude about the future of a technology can be a sign for it being disruptive (Bower & Christensen, 1995). Second, companies can develop mechanisms aimed at collecting ideas with potential future value from both internal and external stakeholders. These can then be activated at the appropriate time in order to respond to external developments (Kumaraswamy et al., 2018). Finally, when faced with an innovation, incumbents can identify its characteristics in terms of functionality, technical standards and ownership in order to determine whether the innovation is disruptive or not. If the innovation has the characteristics of a disruptive one, the incumbents needs to identify where in its value chain the innovation is used and compare it to the currently employed technologies. Using this information, the incumbent can determine whether the innovation is disruptive for them or not (Nagy et al., 2016).

In summary, all of the presented strategies for identifying disruptive innovations require the gathering of disruptive intelligence. This refers to all information aimed at answering the questions (1) whether disruptions are possible in this business, (2) whether an innovation is potentially disruptive, (3) whether disruption is currently going on, and (4) whether the focal firm suffers from disruptive blindness (Virens & Søilen, 2014)[1]. Thus, incumbents need to ask themselves all four questions in order to be able to identify disruptive innovation.

It has been proposed that the concept of open innovation, i.e. the purposeful inflow of knowledge from external sources to foster innovation processes internally, can be beneficial in the gathering of disruptive intelligence (Cozzolino et al., 2018; Karimi & Walter, 2015).

[1] Please see Vriens & Søilen (2014) for an overview of indicators that can be helpful in answering all four questions.

On top of that, it has also been proposed absorptive capacity, i.e. a company's capabilities for internalizing external information, also constitutes a crucial success factor in its gathering of disruptive intelligence (Khanagha, Ramezan Zadeh, Mihalache & Volberda, 2018).

Once a disruptive innovation is identified, incumbents are faced with the challenge of developing a strategy for responding to it. Research has argued that there are a variety of possible strategic responses for incumbents in the face of disruption. These can broadly be grouped into responses that are focused on the new, disruptive technology and responses that are focused on the old, existing technology.

Christensen and Raynor (2003) developed three distinct strategic responses for cultivating disruptive innovations. First, the incumbent can directly adopt the disruptive innovation, which requires changing both the processes and values of the incumbent. As argued above, this move entails a variety of challenges for the incumbent, ranging from disruptive innovations often being financially unappealing to the dependence of incumbents on external actors in terms of resources hindering it. As such, it is no surprise that this strategic response has been found to have a weak track record. (Christensen & Raynor, 2003; Sandström et al., 2009)

Second, the incumbent can release resources in order to create an autonomous organization outside the boundaries of the incumbent. This new organization is independent from the incumbent in its objectives and operations. The logic is that the disruptive innovation is allowed to evolve within this organization without being constrained by the incumbents rigid processes and conflicting strategies. At the same time, the new organization is able to develop the capabilities and values necessary for the disruptive innovation. Not only has this strategic response been found to have a good track record, it is also the response recommended by Christensen. (Christensen 1997; Christensen & Raynor, 2003; Ho & Chen, 2018; Sandström et al., 2009)

Third, the incumbent can acquire other companies that already possess the capabilities and values required for developing the disruptive innovation. This results in the incumbent not having to develop these capabilities and values itself. Rather, it enables the incumbent to directly incorporate them, a process that might require less time and / or capital than own development. (Christensen & Raynor, 2003; Sandström et al., 2009)

However, researchers have argued that there are also different strategic responses possible for incumbents to further exploit existing technologies in the face of disruption. On the one hand, the incumbent can excessively invest into their existing capabilities and technologies in an effort to "extend current performance-improvement trajectories" (Christensen et al., 2018, p. 1062-1063). The resulting improved performance of the incumbent's products would increase the performance gap between it and the disruptive innovation, thus prolonging the time needed to catch up enough for the mainstream customer segment to switch to the disruptive innovation. Consequently, the disruption of the existing products is delayed, endowing the incumbent with more time to react to it. (Adner & Kapoor, 2016; Adner & Snow, 2010; Christensen et al., 2018; Ho & Chen, 2018)

On the other hand, the incumbent can reposition their existing technology in its home market by focusing on market niches. The logic is that in the advent of new technologies and disruptive innovation the market will change and new market niches will spawn. By focusing on these niches, the incumbent can develop new market applications for their existing technologies. (Adner & Snow, 2010; Christensen et al., 2018; Ho & Chen, 2018)

Finally, researchers have also identified hybrid strategic responses focusing on both the cultivation of disruptive technologies and the exploitation of existing technologies (Anthony, Gilbert & Johnson, 2017; Christensen et al., 2018; Ho & Hongy, 2018; Leavy, 2017). Based on a number of theoretical propositions, Ho & Chen (2018, p. 352) have developed a "systematic way to navigate technological disruption" that includes both disruptive and old technologies. The authors argue that disruptive innovation do not necessarily render all existing technological capabilities obsolete. Incumbents have to differentiate which capabilities are disrupted and which capabilities are sustained. Once the incumbent has identified which capabilities are affected in what way, the strategy is twofold. On the one hand, the incumbent has to fully adopt the disruptive innovation as soon as possible in an effort to substitute the disrupted technological capabilities. This part of the strategy is similar with the direct adoption strategy identified by Christensen and Raynor (2003) (c.f. above). On the other hand, the incumbent has to find new applications for the sustained technological capabilities, e.g. through the identification of emerging market niches, and exploit them as long as possible. The authors argue that this diversification offers the best opportunity for

incumbents to grow in the face of market disruption. While this strategy requires the incumbent to have high levels of organizational ambidexterity - defined as "a dynamic capability to explore and exploit simultaneously" (Ho & Chen, 2018, p.355) - it is argued that it might be able to overcome the innovator's dilemma and thus reduce internal conflicts (Christensen et al., 2018). This is due to the fact that it allows for investments in the disruptive technology necessary for the incumbent's long-term survival while the continuous exploitation of the existing technology ensures the short-term profitability needed to satisfy the demands of external stakeholders (Ho & Chen, 2018; O'Reilly & Tushman, 2008).

In summary, incumbents are faced with a variety of potential strategic responses to disruptive innovation. Research has emphasized that the success or failure of these responses can be influenced by a variety of incumbent characteristics, such as firm size and position in the respective industry (Sandström et al., 2009), misalignment capability (Khanagha et al., 2018), access to in-house users and pre-disruption component experience (Roy & Cohen, 2015), and organizational identity (Kammerlander et al., 2018).

2.1.5 Disruptive Business Model Innovation

A company's success in responding to disruptive innovation is mainly determined by its ability to adapt its business model (Cozzolino et al., 2018). As argued above, existing business models are usually not aligned with disruptive innovations (Kumaraswamy et al., 2018). On the one hand, new market opportunities may arise with the introduction of disruptive innovations that require new business models in order to fully capitalize on them. On the other hand, disruptive business models of new entrants may render existing business models obsolete. Thus, adopting disruptive innovation successfully requires companies to innovate on their business model (Assink, 2006; Christensen et al., 2009; Cozzolino et al., 2018; Danneels, 2004; Karimi & Walter, 2016).

As discussed above, business models refer to the architecture of how a company creates, delivers and captures value. Consequently, business model innovation refers to companies changing their existing business models or adopting new ones (Mezger, 2014). Research has repeatedly argued that a company's ability to innovate on its business model requires the utilization of dynamic capabilities (Karimi & Walter, 2015; Mezger, 2014; Teece, 2007)

In order to be able to define dynamic capabilities, one has to first define ordinary capabilities. These refer to an organization's existing routines and zero-level capabilities. In other words, they represent how an organization conducts business and thus represent the existing business model. Dynamic capabilities, on the other hand, are defined as an organization's ability to to change its ordinary capabilities in order to respond to changing environments and are determined by the organization's existing resources, processes and values. (Karimi & Walter, 2015)

Teece (2007) introduced a commonly used framework dividing dynamic capabilities into three interconnected sets of abilities. First, sensing capacity refer to the focal company's abilities to identify potential opportunities and threats. Second, seizing capacity refers to its ability to seize benefits from opportunities. Third, reconfiguring capacity refers to its ability to "maintain competitiveness through enhancing, combining, protecting, and [...] reconfiguring the business enterprise's intangible and tangible assets" (Teece, 2007, p. 1319). Building on this framework, Mezger (2014) investigated the relationship between dynamic capabilities and business model innovation. In particular, he used several case studies to analyze firms' "capacity to sense business model opportunities, seize them through the development of valuable and unique business models, and reconfigure the firms' competences and resources accordingly" (Mezger, 2014, p. 429). This 'capability-based conceptualization of business model innovation' is further explored in the *Theoretical Framework* section of this paper.

2.2 Literature Review of Eco-Innovation Theory

The literature with regards to innovation for sustainability is in an emerging stage and coined different terms with different conceptualizations, such as eco-innovation (Pujari 2006; Wagner and Llerena 2011; Horbach, Oltra, and Belin 2013), sustainability-oriented innovation (Adams et al. 2016), green innovation (Chen, Lai, and Wen 2006), inclusive growth innovation (George, McGahan, and Prabhu 2012) and social innovation (Harrison, Klein, and Browne 2011). This paper will focus on the term eco-innovation and elaborate on the definition and implications.

The term eco-innovation refers to any innovation that reduces the environmental impacts of both production and consumption activities while sustaining economic returns. This is generally achieved through one of to approaches: (1) increasing the usage efficiency of natural resources or (2) reducing the emission of pollutants. However, it is worth noting that these approaches are not only applicable at the 'end-of-pipe', but rather during the entire life cycle. In recent years, society as a whole has become increasingly concerned with sustainability issues, especially climate change, environmental pollution and resource scarcity. The resulting "pressure from the government and market incentives [have] compelled companies to be innovative in their business operations in the pursuit of both economic and environmental goals" (He, Miao, Wong & Lee, 2018, p. 503). This has lead to an increasing interest in the concept of eco-innovation. In particular, it has given rise to a variety of research investigating eco-innovation, its drivers and barriers, and its effect of both individual companies as well entire economies. (García-Granero, Piedra-Manoz & Galdeano-Gómez, 2018: He et al., 2018; Kiefer, Carrillo-Hermosilla, Del Río & Callealte Barroso, 2017; Kiefer, Del Río González & Carrillo-Hermosilla, 2019; Tarnawska, 2013)

However, the term eco-innovation does not only refer to sustainable innovation happening on a product-level. Rather, it represents the process of renewing or changing existing products, processes, organizational structures or marketing activities (García-Granero et al., 2018; Macron, de Medeiros & Ribeiro, 2017; Xavier, Naveiro, Aoussat & Reyes, 2017). Because of their comprehensive nature eco-innovations can transcend organizational boundaries into a broader societal context, where they can challenge existing norms and structures (He et al., 2018). It is thus not surprising that researchers have continuously stressed the importance of eco-innovations for enabling a change towards more environmentally and socially sustainable economies and societies. In particular, their importance in transitioning from linear towards circular economies has been emphasized repeatedly. (De Jesus, Antunes, Santos & Mendonca, 2018; Kiefer et al., 2017; Kiefer et al., 2019; Mazzanti, 2018; Tarnawska, 2013)

2.2.1 Economy of Eco-Innovation

Yet, the concept of eco-innovation is not based on companies' altruism to spend resources for the betterment of society alone. Instead, researchers such as Cai and Li (2018) have investigated the influence of eco-innovation on company performance. It was found that

developing eco-innovation significantly increases a company's environmental performance. Environmental performance, on the other hand, enhances a company's overall economic performance. As such, engaging in eco-innovation has an indirect positive effect on a company's economic performance.

One frequent criticism of eco-innovation is that the concept is inadequately delimited and that an underlying set of characteristics needs to be defined (Kiefer et al., 2017; Xavier et al., 2017). In an effort to tackle this problem, Kiefer et al. (2017) investigated four different dimensions of eco-innovations, namely design, user, product-service, and governance, and derived specific characteristics of eco-innovation for each of the dimensions. First, in terms of design, eco-innovations involve a technological change compared to existing solutions. Second, in terms of users, eco-innovations are characterised as being a response to users' sustainability demands. Third, in terms of the product-service dimension, eco-innovations entail a change in a company's value proposition. Finally, in terms of governance, eco-innovations require the involvement of a variety of stakeholders from outside the boundaries of the company, referring back to eco-innovations being part of a larger societal context (cf. above).

While all eco-innovations share the aforementioned general characteristics, they vary in other, more specific characteristics. As such, they can be both incremental improvements to existing solutions or radically new solutions. They can be the response to outside pressures or originate from within the organization. Finally, they can sustain existing capabilities or fully disrupt them. (Kiefer et al., 2019)

Due to this versatility, it is crucial to understand the dynamics of eco-innovations inside organizations. Adapting the 'driver → source → position → performance' framework developed by He et al. (2018), these dynamics can be divided into four parts:

- The drivers for (and barriers to) adopting eco-innovations
- The strategies for adopting eco-innovations
- The implementation of eco-innovations into the focal organization
- The effect of eco-innovations on the focal organization's performance

The motivation for an organization to adopt eco-innovations can come from and is influenced by a variety of sources. However, these sources can generally be divided into two groups, namely external drivers and internal drivers. The central external drivers inducing the adoption of eco-innovation research has identified are regulatory pressure from governments and customer demands. On top of that, other market demands and technological advances can also compel an organization to adopt eco-innovations. On the other hand, internal factors able to encourage the adoption of eco-innovations are innovation capacity, efficiency, corporate culture and managerial concerns for the environment. While these external and internal drivers affect the probability of organizations to adopt certain eco-innovations, the extent of this adopting is likely to rely on other internal factors such as organizational capabilities and resources. (Cai & Li, 2018; He et al., 2018; Kiefer et al., 2019; Salim, Ab Rahman & Wahab, 2019; Tsai & Liao, 2017; You, Zhang & Yuan, 2019; Zubeltzu-Jaka, Erauskin-Tolosa & Heras-Saizarbitoria, 2018)

However, there are also certain factors hindering the adoption of eco-innovations. One of the main barriers frequently discussed is technological path dependency and subsequent lock-ins. This refers to organizations being reliant on the currently used technologies to an extent where they are unable to change to new technologies. In other words, they are locked into their existing technologies and, as a result, are unable to adopt novel eco-innovations. Other potential barriers include cooperation, organizational learning and corporate goals. (Cecere, Corrocher, Gossart & Ozman, 2014; Kiefer et al., 2019).

The strategies organizations use in order to adopt eco-innovations can be either reactive or proactive. This is - at least partly - determined by the factor(s) motivating the organizations' adoption and has ramifications for the type of eco-innovation that will eventually be implemented. As the name suggests, reactive strategies refer to an organization reacting to external factors such as regulatory pressure, customer demands or competitors' actions. They are generally aimed at perpetuating existing products, processes and organizational structures, yet incrementally improving them in order to adjust to the new circumstances. Proactive strategies, on the other hand, refer to voluntarily adopting eco-innovations without external pressures. Rather, they are a response to internal drivers of eco-innovations, such as improving process efficiency or becoming the environmental leader in a market. While these

strategies can also entail incremental improvements to existing structures, they have the potential to result in radical innovation as well. (He et al., 2018; Salim et al., 2019)

Implementing eco-innovations can consist of up to three different aspects, namely the implementation of new or changed products, processes and organizational structures. In terms of products this can be done through improvements at any point in the product's life cycle, e.g. using recycled materials or adopting eco-design. In terms of processes it refers to the improvement of eco-efficiency, for example through end-of-pipe pollution control or environmentally friendly production technologies. Finally, in terms of organizational structures, the implementation of eco-innovation refers to reconfiguring existing routines and structures in order for them to be better aligned with environmental goals. This can be done, for example, through the implementation of environmental management systems such as the EU Eco-Management and Audit Scheme and committing to green supply chain management. In summary, research has argued that an organization's eco-innovation performance depends on its ability to manage the implementation of eco-innovations at all three levels (i.e. products, processes & organizational structures) simultaneously. (García-Granero et al., 2018; He et al., 2018; Lee, Wu & Tseng, 2018; Motta, Issberner & Prado, 2018)

Aa such, an organization's eco-innovation performance can be measured in three different ways. First, one can measure market-based performance using indicators such as market share and customer loyalty. These reflect how well the organization meets its customers' demands. Second, one can measure accounting-based performance using indicators such as profits and traditional return ratios in order to assess the organization's profitability. Finally, one can measure operational-based performance using indicators such as energy usage efficiency and production costs. These, in turn, reflect the organization's operational efficiency. (He et al., 2019)

2.2.2 Eco-Innovation and Business Model innovation (BMI)

The implementation of eco-innovation is becoming increasingly common because it is now regarded as a key source of competitive advantage, not as a burden (Nidumolu, Prahalad, and Rangaswami 2009).

In order for companies to implement this structural change for sustainability, radical and systemic innovations are needed (Boons et al., 2013), but technological development and innovation cannot address sustainability matters by themselves, because sustainability is a systemic and multilayered issue (Geels 2010). In fact, it has been shown that in order to take into account economic, social and environmental measures, major innovations for firms are required (Eccles and Serafeim 2013), in most of the cases demanding a reconfiguration of their core value proposition, that is their business model (Kiron et al. 2013).

A business model is the "unit of analysis" (Zott, Amit, and Massa 2011) or explanation of the architecture following which the company creates, delivers and captures value in a system of internal and external components (Casadesus-Masanell and Ricart 2010; Demil and Lecocq 2010; Teece 2010; Amit and Zott 2012; Matzler et al. 2013).

The business model is also described as a platform between the company's strategy and practice (Teece 2010); thus a sustainability business model (SBM) approach explains how strategic sustainability and performance objectives can be integrated in successful business practices that also include external stakeholders (e.g. society and the environment).

This implementation entails a co-evolutionary process between technologies, social practices and institutions toward sustainability, that supports the creation of products or services that are not only of interest of the environmentally concerned customers, but also to those who seek economic efficiency, creating a competitive advantage and offering new value propositions (Inigo et al., 2017; Boons et al., 2013).

2.2.3 Sustainable Business Model Innovation (SBMI)

Sustainable Business Model Innovation (SBMI) has emerged as a model that offers innovative solutions to minimise the adverse environmental impacts of the value chain, maximise societal and environmental benefits and generate new value propositions that promote market needs and economic value while serving society and the natural environment (Inigo et al. 2017).

SBMI is an approach for companies to restructure and rethink how they create and deliver value in order to improve the environmental and social sustainability. It is described as such: "innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organization and its

value-network create, deliver value and capture value (i.e. create economic value) or change their value propositions." (Bocken et al. 2014, 44).
Stahel (2007) sees the SBM as a business model that uses little resources, it is based on a closed material loop, closed liability loop and sells a service rather than a product.

Another key aspect of SBMI, is the inclusion of environmental and societal stakeholders into the business model. This helps creating a stronger relationship with the surrounding ecosystem and a clearer long-term strategy for sustainability. In fact, Bocken et al. (2014) suggest that SBM provide a link between technological and social innovations and systemic sustainability, resulting in a stronger corporate and social performance compared to what can be achieved with other strategies. On the one hand, the relationship that firms need to establish with their external environment through SBMI creates the basis for a stronger systemic vision than it would with other types of innovation (Stubbs and Cocklin 2008).
On the other hand, the incorporation of external environment as a stakeholder increases the complexity of the innovation process (Klewitz and Hansen 2014; Adams et al. 2016) and the number of factors that have to be taken into account (Stubbs and Cocklin 2008; Bocken et al. 2014). Thus a successful transition through SBMI requires strong managerial and organizational capabilities.

Based on the classification of radical and evolutionary innovation or business model innovation, SBMI has also been divided into two: radical SBMI and evolutionary SBMI (Inigo et al. 2017).
Evolutionary SBMI implies incremental changes to the business model already in place, which are made by redesigning the internal stakeholder interaction and organizational and managerial capabilities, while radical SBMI implies a completely new business model for the company and rethinks company capabilities by reconfiguring organizational and managerial capabilities and changing the organizational structure to achieve broader socio-technical system transitions (Geels 2010).

The evolutionary approach is based on adjustments in the value chain and value capture models to respond to a changing environment due to the gradual incorporation of sustainability in the market. This fine-tuning of existing models is driven by new customer

needs and has the purpose of entering new markets or committing to sustainability as a company effort.

The radical approach entails a solution to a new challenge or a radical new solution to an already known challenge. It revolves around the introduction of a new value proposition, value creation and value capture system in the market. Voelpel, Leibold, and Tekie 2004 argue that this approach can be used to remove the company from a previous unsustainable lock-in in its industry or to jump ahead of competitors by developing a new business model, thus creating new markets for sustainability.
The effects of radical SBMI transform the entire structure and logic of the business model, aiming for a systemic, holistic socio-economic-environmental value creation, therefore many companies explore this SBMI approach through spin-offs while keeping the mother company stable and unchanged. This works particularly well because incumbents can rely on "a stable source of income from old business models that can cross-subsidize new business models" and support their growth (Sosna et al., 2010, p. 403).

2.2.4 Categories of SBMI

In order to understand the various shapes that SBMI can take, this paper will present the 9 archetypes described by Laukkanen and Patala (2014, p. 4) adapted from Bocken et al. (2014). These archetypes are: (1) Pollution control, (2) Maximise material and energy efficiency, (3) Create value from "waste", (4) Substitute with renewables and natural processes, (5) Deliver functionality rather than ownership, (6) Adopt a stewardship role, (7) Encourage sufficiency, (8) Re-purpose the business for society/environment, and (9) Develop scale-up solutions.

The first four (1-4) archetypes are centered around technological innovations in product and manufacturing. The focus is on minimizing the resources needed and the efficiency of the processes in order to lower the pollution or to switch to new energy sources and recycling the materials. From number 5 to 7, the archetypes are social innovations, focused around the consumer experience and perceived value. The focus here is to lower the production requirements by offering a service rather than a product, ensuring the customer well being in

the long term and changing the consumer behaviour toward a more responsible attitude and use of the services or products, thus lowering the demand from the market.
The last two (8-9) are based on a systemic and holistic implementation of sustainability. "Repurpose the business for society/environment" aims at providing social and environmental benefits rather than economic to the stakeholders and to redesign the business around it, while "develop scale-up solutions" aims at delivering mass solutions for sustainability through major companies partnerships that can also be cross-industry.

One model that was not listed in the archetypes is the sharing business model. In fact, this does not necessarily fall under the SBM archetypes. According to different scholars (Frenken and Schor, 2017; Martin, 2016; Murillo et al., 2017; Plewnia and Guenther, 2018) sustainability and the sharing business model do not overlap. The sharing economy and its BM may present negative impacts in the development of the value transfers. Nevertheless, there are also plenty of social benefits deriving from this particular BM.
The focal idea of the sharing economy is the social value of communal consumption, which fosters trust and social bonding (Acquier et al., 2017; Belk, 2010; Benkler, 2017; Habibi et al., 2016; Palgan et al., 2017). Moreover, it democratizes access to many products that can be too expensive (e.g. carsharing) for some customer segments (Acquier et al., 2017).

The impact of the sharing model was thought a priori to be beneficial, but after its implementation the environmental effects are being questioned, especially in the auto industry. Democratizing access to cars by offering low prices, may induce customers to shift away from greener mobility options such as bikes or public transport, thus increasing the traffic and the pollution attributed to cars. But these impact assessment calculations are rather complex and entail a high amount of factors.
Following up on the example of carsharing, rather than a static model of impact assessment, Firnkorn and Shaheen (2015) propose a dynamic view which could support policymakers and academics when establishing the impact of carsharing adoption on a wider scale. Carsharing is currently going from a niche to a mainstream transportation mode and it has the potential to provide a more sustainable option compared to private cars, by reducing the overall motor-vehicle traffic in cities and the overall production of cars.

It holds true that a low diffusion of the sharing BM can have unwanted effects, appealing only to those who could not afford the service in the first place and thus increase consumption. On the other hand, the adoption of sustainable sharing features in the business model of incumbents could pave the way for its diffusion and institutionalize sustainable sharing practices, thanks to the visibility, legacy and size of the incumbent itself (Ciulli and Kolk, 2018).

2.2.5 Adopting new SMB

As argued in the previous paragraph, in order for the sharing economy to become sustainable and not to appeal only to a small segment thus creating a new consumption group, it has to be a widely adopted model.

Incumbents play a critical role in this process of large scale adoption because they have the possibility to influence the masses and push this new model, but also because they have the power to stop new entrants who are endangering the incumbent's position in the market by pushing a new sharing model which would be in conflict with standard models, for example consumerist production versus sharing economy model.

There are two known ways for SBMs such as the sharing economy to become the market standard: either the incumbents adopt it and use their influence to make it the predominant model or the entrants have to disrupt the incumbents who refuse to transition toward this new paradigm of sustainable business.

Incumbents see these new models as a threat that could drive them out of business if not tackled in the right way. Moreover, the introduction of sustainability as a competitive advantage changes the "rules of the game", by opening the market to emerging companies that are already strong on this new key driver, sustainability.

For this reason, a lot of research has been done on the topic of incumbents innovating toward SBMs. The driver for this transition can be either internal, resulting from the firm or the individual managers creative efforts, or external, also called mimicry, when responding to a new entrant by imitating its business model (Bohnsack et al., 2014; Halme et al., 2012; Schaltegger et al., 2016). The transition toward sustainability through innovation of the business model holds many challenges related to the prior business model, which was not built on the basis of sustainable key factors. These challenges relate to the negative effects of financial incentives to think short term, to utilize the assets and structures already in place

and the risk of damaging the existing business model, in fact many incumbents suffer from a dominant logic of path dependency and industry lock-ins, which inhibits innovation (Bohnsack et al., 2014; Halme et al., 2012; Schaltegger et al., 2016)
However, scholars have also identified factors that may help this transition for incumbents. These factors include complementary assets and organizational slack (Bohnsack et al., 2014; Fuentelsaz et al., 2015; Roy and Sarkar, 2016; Schaltegger et al., 2016).

In order for incumbents to be able to experiment and free themselves of the dominant logics and path dependency that hinders this process, often companies utilize spin-offs in which they are free to create and test new SBMs (Sosna et al., 2010). Partnerships, as indicated by many scholars, can be another path to pursue SBMI. They can be used both for complementing a business model that will still be managed by the incumbent, or to create a joint one of which the management will be shared with the partner (Dahan et al., 2010; Wadin et al., 2017).

2.2.6 Dynamic Capabilities with SBMI

Incumbents that adopt new BMs through innovations for sustainability have to face the above mentioned challenges and, in order to overcome these challenges, they need to develop new organizational, technical and managerial capabilities. In fact, to achieve a successful BMI (for sustainability or others) the goal is to transform the existing capabilities and to understand the main dimensions of evolutionary and radical BM (Demil and Lecocq 2010).
In order to understand how to reshape the capabilities to successfully achieve a SBMI, this paper will introduce the framework of Inigo et al. (2017) adapted from the framework of dynamic capabilities from Teece (2007) which disaggregates into two categories (Radical and Evolutionary SBMI) and three functions: sensing, seizing and reconfiguring.

2.3 Overview of the Automotive Industry

This paragraph recounts the early development and diffusion of the ICE, the establishment of the automotive industry and the creation of technological lock-ins in the automotive and oil industry. The second paragraph presents the technologies and threats of the new automotive industry paradigm.

2.3.1 The Old Paradigm

In the early twentieth century the horse carriage was disrupted by three new technologies: electric motors, steam engines and internal combustion engines. The electric car was a clean and quiet method of locomotion but it had the disadvantages of short range, long recharging time and limited locations for refueling. Moreover the technologies regarding electricity and batteries were still in the early stages of development and not efficient. The steam engine had the disadvantage of requiring two infrastructures, one for fuel and the other one for water supply. Despite these drawbacks, the electric motors and the steam engines were the dominant technologies in the first years of the twentieth century (Geel, 2005).

At this point, cars were still a niche transportation compared to horse carriages. Only with the advent of the Model T by Henry Ford, the cost of ICE vehicles decreased drastically thanks to the innovation known as the assembly line, making cars available to a wider public. The internal combustion engine (ICE) had the advantage of being able to use the same existing gasoline infrastructures available for domestic use (gasoline at the time was used for heating and light). The lower price of the vehicle and availability of infrastructures contributed to consolidate the dominance of ICE over the other propulsion technologies (Melaina, 2007).

ICE diffusion, first in the US and then in the rest of the world, created one of the major industries in history, the automotive industry. The market has been traditionally dominated by the US, that in 1960 produced 75% of the vehicles in the world. China is now the biggest vehicle manufacturer with about 28 million units produced per year, followed by the US with about 12 million yearly units. (Xavier et al, 2017)

The diffusion of the ICE automotive technology is an example of the technological lock-in in an industry. Unruh (2000, 2002) argues that due to the presence of increasing returns on adoption, industrialized economies have been locked in fossil fuels by a process of technological and institutional co-evolution. The carbon-lock in (technologies that rely on fuels that result in the emission of CO2) was the result of changes in the technological, institutional, organizational, industrial and even social level, which created the foundations for the TIC (technological-institutional complex) based on fossil fuels (Unruh, 2002). The automotive TIC is protected by dominant firms, which benefit from their small numbers in order to coordinate and create barriers to resist possible new technologies that could

substitute fossil fuels. Overall, the TIC blocks the diffusion of new clean technologies that could threaten the dominance of fossil fuels, even when those technologies are competitive in terms of cost (Kemp et al., 1998).

It must be noticed that incumbents will usually not be the first to introduce new technologies. In fact they resist major changes and are interested in preserving the dominance of existing technologies. It is rather new actors that initiate the process that gives birth to disruptive technologies (Geels, 2005). The way in which the industry works to block these new technologies is fairly easy. Whenever a threat of new technologies arises in the market, the dominant firms have an incentive to improve the efficiency of the existing technology in order to slow down the diffusion of the potential new technologies.
Because of their dominant role in the current paradigm, automotive and oil companies act as the protectors of current technologies as they want to keep their core business intact and maximise the return on their investments. As a matter of fact, they responded to new propulsion innovations by using their extensive knowledge of ICE in order to improve the efficiency of the existing engine technology and lower the tailpipe emissions (McNutt and Rodgers, 2004).

This strategy is quite effective in the short-term since it raises the prerequisites that an innovative fuel or engine has to reach in order to compete with oil and ICE, proving it much harder for new entrants to produce a viable alternative and thus making the alternative locomotion system less appealing to mainstream consumers.
Unfortunately for incumbents this is not a sustainable strategy in the long term, as it is only a way to slow down and not to block the development of clean technologies. Moreover, this strategy is being challenged by the increasing internalization of the negative externalities of ICE, while at the same time the ICE technology is reaching its physical limits, thus making increasingly hard to improve its efficiency and resist the change (Bento, 2010).

2.3.2 The New Paradigm

The automotive industry has seen no major innovations for more than a hundred years and the dominant architecture has remained unchanged. In fact when analyzing the industry using Porter Five Forces model (Porter, 1989), nothing can substitute the automobile in terms of

convenience (Xavier et al, 2017). The bargaining power of suppliers is low and consumers rely on big brands, while investments in assets and R&D required to enter the market are exorbitant. To exemplify this concept, Volkswagen, one of the biggest automotive firms, holds the top R&D budget in the world, amounting to $13.2 billion (PricewaterhouseCoopers, 2017). This creates a situation where dominant firms are unlikely to be displaced by entrepreneurs introducing new technologies, which in turn face huge barriers to entry and thus incur very high risks when trying to enter the market.

This period of static dominance of the incumbents is beginning to end. The first signs of disruption were in 2007 when the Palo Alto startup Better Place promised to revolutionize the automotive industry. This new venture had a revolutionary business model to commercialize electric vehicles: it relied on selling the vehicle without the battery thus dramatically lowering the cost of buying the electric vehicle (EV). The battery would then be property of Better Place and whenever it ran out of energy it could be swapped with a charged one. (Lunden, 2013)

This project raised an unprecedented amount of investment for a startup in the automotive industry (more than $700 millions in venture capital) and attracted the interest of the Israeli government which invited the company to establish there. They had solved the problem of long recharge time, lowered the cost of the vehicle and attracted an incredible amount of investment, but this did not suffice. When the product was launched and the adoption of the new technology proved harder than forecasted, the small market share couldn't sustain the costs incurred and Better Place had to file for bankruptcy (Lunden, 2013).

Since then, the world has seen a movement to disrupt the automotive industry taking shape and attracting more investments every year. On one hand, the disruption of many technological industries, for example the smartphone industry, has led to the improvement and development of technologies (e.g. batteries, software, processors, IoT and many more) that can be also applied to the automotive industry. On the other hand, the development of new business models changed the way in which a company creates value and gathers revenue from cars.

Elaborating on these signs, consulting firms are taking the disruption of the automotive industry as granted and imminent. KPMG (2013, 2014) predicts an increasing adoption of the carsharing model from the majority of the consumers, while McKinsey & Company

(2016) forecasts some new major trends for 2030 such as a meaningful share of the vehicles produced being autonomous vehicles, a shift in the revenue pools toward shared mobility, and the emergence of new entrants targeting specific segments.
The automotive industry is undergoing a paradigm shift driven by new technologies (i.e. self-driving systems, 3-D printing, new battery technologies) (Swan, 2015) and new opportunities will open up for entrants, making the automotive more horizontal and modular for a short period (Fine, 2000). But at the same time, the automotive industry requirements for safety and compatibility assurance anticipates a winner-take-all-dynamic where, at the emergence of a dominant design, the winning companies will again expand vertically and establish themselves as oftens happens in digital markets (Varian & Shapiro, 1998).

Thanks to these new technologies being introduced in the automotive industry, the car has become a platform more similar to a computer or a smartphone. For example, Teslas can be updated via the internet where bugs can be fixed and new updates deployed (Brisbourne, 2014). It is clear that these new features require new capabilities that come from a different domain than the standard automotive capabilities, thus giving a possibility to smartphone and software companies like Google and Apple in the future of self-driven and shared EV.

The rise of new technologies is not the only factor driving changes in the automotive industry. In fact, in regards to environmental hazards the automotive industry is seen as one of the key polluters, thus requiring a change of direction on the aspect of CO2 emissions. In order to stabilize the temperature and avoid catastrophic consequences to the flora and fauna of the earth, studies suggest that carbon dioxide emissions must be reduced in all sectors by 50% and 80% before 2050 hoping to restabilize the temperature at pre industrial levels (IPCC, 2007).
Some experts argue that it is already possible to reduce CO2 emissions by 50% with the widespread adoption of hybrid engines (IEA, 2009; Schafer et al, 2006) but as the forecasted growth in emerging countries such as China and India is estimated to triple the world car fleet by 2050 (IEA, 2009; WBCSD, 2004), it will not be enough.
In fact, Bento (2010, p. 7198) argues that a "deeper carbon dioxide emission cuts may be unavoidable thus requiring the introduction of radical innovations such as electricity or hydrogen" referring to EV and vehicles powered by hydrogen fuel cells.

The imminence of disruption in the automotive industry is widely accepted, such that the debate revolves mainly around the breadth, depth, main factors, outcomes and likely winners of this revolution instead of its existence or nonexistence.

This unprecedented convergence of technological disruption, alternative drive systems, digital technologies, concerns about sustainability and emissions, new business models and new entrants, is leading toward a new industrial paradigm.

Tesla, the automotive company founded in 2003, is an example of how the industry has changed and has opened up to new entrants. Differently from OEM's incumbents, its core technological competencies are: battery pack, power electronics, high efficiency motor, and electronic control software. Tesla was able to vertically integrate the different technologies through its strategy to acquire internal know-how by hiring fields experts such as expert automotive engineers, experts in automotive design, experts in manufacturing and experts in digital technologies coming from industries such as the smartphone industry.

Tesla has now been taken as a case study to analyze the possibility of new entrants coming in the automotive industry. Perkins and Murmann (2018) used the Tesla case to estimate the cost of designing, producing and entering the market of EV vehicles. Their calculations show that the price is very much in reach of tech giants (e.g.Google and Apple) who are already positioning themselves in the software-market for intelligent vehicles.

Contrary to what Perkins and Murmann (2018) argue, barriers to entry for EV design and manufacturing are not low, as shown by Tesla's need for high amount of external investment and necessity to master a wide variety of capabilities and act as a system integrator. Moreover, Tesla's achievements were not easy nor fast and subject to a share of luck, and as far as 2019 they are still struggling to achieve mass production, which would finally prove the success of the company.

Another example is Uber, founded in San Francisco in 2009, which through its innovative business model became the most valuable startup in just 6 years (valued at $70 billion: The Economist, 2016), is a successful example of shared mobility operated through a mobile platform. It was able to pull such a feat thanks to the availability of the newest technologies in the automotive and in the smartphone industry, and given its success it shaped the actions that incumbents had to take in order to respond to this new paradigm.

In fact, on the technological level, Uber can be seen exclusively as a software company given that it doesn't own the car fleet that it coordinates, avoiding the heavy assets investment that a carsharing company owning the car fleet has to undergo.

As Perkins and Murmann (2018) note, there is substantial risk for value-migration in the automotive industry, moving away from the existing capabilities toward autonomous driving or transportation-as-a-service platforms. Tech giants see the opportunity to fill a value chain gap with platforms as a key distribution channel. Car manufacturers will have to become reliant on these companies if they cannot manage to develop an attractive platform themselves.

Teece (2018) argues that, set apart the barriers to entry, the new technologies and trends that are developing in the automotive industry may pose a challenge to incumbents. In this long time paradigmatic-mature industry, the expanding capabilities requirements are changing the competitive base, not just in terms of technology but also in terms of business model and markets. In this moment of the market, a radical business model innovation, such as carsharing, can prove as disruptive as any competence-destroying technological innovation.

2.4 Research Problem

The above literature reviews of disruptive innovation theory and eco-innovation theory demonstrate that the two research streams share certain commonalities in that they are both concerned with incumbents being required to innovate on their business models in order to stay competitive when economic environments are changing. In particular, both research streams point to the importance of dynamic capabilities for incumbents' long-term competitiveness and the transition into new BM. In the review of the literature both streams have been shown to be widely researched, but no link has been found that connects the two types of innovation. Research has yet to consider business model innovations that are both disruptive and ecologically sustainable at the same time.

The presented overview of the automotive industry further emphasizes the need to close this gap. It demonstrates how a particular business model innovation, i.e. carsharing, has the potential to be both disruptive and ecologically sustainable for incumbents, i.e. car manufacturers. As prior research has solely considered disruptive innovation and eco-innovation independently, the implications of this are uncertain.

This thesis aims at closing the gap in research by employing a dynamic capabilities perspective on eco-disruptive business model innovation. Dynamic capabilities have been identified by previous research as the mechanisms that allow companies to transition from their established business models to new ones. As such, they have been analyzed in the contexts of both disruptive innovation (e.g. Mezger, 2014) as well as eco-innovation (e.g. Inigo, Albareda & Ritala, 2017), making it the closest to a common ground between disruptive innovation theory and eco-innovation theory. Consequently, dynamic capabilities have the potential to bridge the gap between the two theories. This requires a theoretical understanding of the dynamic capabilities perspective as well as a point of reference. For this reason, the following section provides a summary of dynamic capabilities research. Subsequently, two established dynamic capabilities frameworks are introduced.

3 ANALYTICAL FRAMEWORK

As stated above, this section first provides an overview of dynamic capabilities research in general and the taxonomy of dynamic capabilities developed by Teece (2007) in particular. This is followed by the presentation of two established dynamic capabilities frameworks. On the one hand, a framework developed by Mezger (2014) is presented. It is concerned with the dynamic capabilities needed for business model innovation in the light of disruptive innovation. On the other hand, a framework developed by Inigo et al. (2017) is presented which demonstrates the dynamic capabilities required for sustainable business model innovation. A comparison of these two frameworks is then used to derive research questions aimed at bridging the aforementioned gap of eco-disruptive business model innovation through the analysis of dynamic capabilities.

3.1 Review of Dynamic Capabilities

This section will offer an overview of dynamic capabilities as a field of research and present its theoretical underpinnings and implications.

Economic environments are inherently dynamic, implying that as time passes both minor and major developments occur at all levels. This constitutes a constant challenge for companies' competitive advantages, as the respective companies need to adapt to these changes in order to stay competitive long-term (Zúñiga-Vicente & Vicente-Lorente, 2006). Exemplarily, this can be found in the emergence of Web 2.0 technologies that have irreversibly changed the way some companies are expected to interact with its customers (Shuen & Sieber, 2009). On top of that, recent developments in digital technologies have also changed the way value is produced and consumed, resulting in companies being required to innovate on their business models. While these changes are manifold, one example is the advent of sharing economies and sharing business models (Gazzola, 2018). How companies can adopt their business models in order to respond to changes in the environment and to secure competitive advantages has been a prominent topic within academic research for decades. In particular, the importance of dynamic capabilities in the light of adverse conditions has been called out by researchers (e.g. Ludwig & Pemberton, 2011).

While the concept itself can sporadically be found in prior research, the dynamic capabilities perspective started to receive widespread academic attention with Teece, Pisano and Shuen's

(1997) article “Dynamic capabilities and strategic management”. Building on the resource-based view (RBV) of the firm, i.e. the interpretation of a firm’s competitive advantage as a result of its resources and capabilities (Barney, 1991), Teece et al. (1997, p. 509) conceptualized a dynamic capabilities framework that “analyzes the sources and methods of wealth creation and capture by private enterprise firms operating in environments of rapid technological change”. Thus, this framework constituted an attempt to align the static understanding of competitive advantage implied by the RBV with the dynamism of economic environments. The initial framework was later developed further in Teece’s (2007) article ‘Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance’, moving dynamic capabilities from solely being interpreted as a reflection of a company's ability to adapt its asset base in response to changing environments towards also incorporating their ability to shape the development of its environment by innovating on products, processes and business models. As such, dynamic capabilities represent a company’s “capacity to successfully innovate and capture sufficient value to deliver superior long-term financial performance” (Teece, 2007, p. P. 1320).

The dynamic capabilities framework has inspired a plethora of subsequent research in a variety of academic fields (e.g. strategic management, marketing, human resource management, information management, innovation management & entrepreneurship). This has led to some ambiguity regarding its definitions and theoretical underpinnings (Arndt & Pierce, 2018; Barreto, 2010; Breznik & Hisrich, 2014). In an effort to reduce this ambiguity, Barreto (2010) analyzed more than 1,500 articles on dynamic capabilities and consolidated their definitions of the concept. This effort resulted in definition of dynamic capabilities as “the firm’s potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resources base” (Barreto, 2010, p.271). This definition is adopted within this thesis for two distinct reasons. On the one hand, it consolidates the interpretations of a large number of different researchers - and thus perspectives - resulting in a comprehensive overview of the concept. On the other hand, it also largely builds on the three interrelated aspects of dynamic capabilities proposed by Teece (2007), on which this thesis is largely based upon.

In particular, Teece (2007) argues that dynamic capabilities can be divided into three types of capacities, namely (1) the capacity to sense both opportunities and threats, (2) the capacity to seize opportunities, and (3) the capacity to reconfigure existing assets in a way that allows for the seizing of the opportunities identified. These capacities differ not only in their characteristics but also in the organizational processes they stem from (Teece, 2007). On top of that, Breznik and Lahovnik (2016) have found empirical evidence that neglecting one of these capacities can have negative impacts on the deployment of the other capacities, thus suggesting that they are highly interrelated.

Sensing opportunities and threats requires firms to continuously observe the developments in technologies and markets. On the one hand, this involves investing in research analyzing the development of customer needs and the viability of emerging technological possibilities. On the other hand, it also requires firms to hypothesize about future developments the market and the responses of suppliers and competitors respectively. (Teece, 2007)

Naturally, this observation demands firms to gather, filter, interpret and distribute high amounts of specific knowledge about internal and external developments. Firms can put organizational processes in place that facilitate these knowledge-related activities. Teece (2007) offers a number of examples of how organizational processes affect firms' sensing capacities. First, decentralizing organizational structures and endowing employees with greater levels of autonomy can reduce the risk of overlooking developments. Second, collaborating with external stakeholders involved in innovation - such as customers, suppliers and complementors - can help extending search efforts to a broader scope. Finally, it is argued that the use of analytical frameworks (e.g. the dynamic capabilities framework) can help in structuring search activities and prioritizing results.

While organizational processes can help building up sensing capacity, the extent to which a company is able to sense opportunities and threats is also dependent on other organizational factors. Particularly, empirical evidence exists that a company's willingness to cannibalize existing offerings, its level of constructive criticism, its tolerance for failure, its level of environmental scanning and its resources slack are all positively related to its sensing capacity (Danneels, 2008).

Seizing opportunities involves two actions. On the one hand, firms have to make unbiased investment decisions - i.e. decisions about which technologies to invest in, how much to invest in these technologies, and when to invest into them - based on hypothesis on market developments and investment payoffs. On the other hand, firms have to adapt their existing business model or adopt a new business model in order for it to fit the investments and reflect chosen commercialization strategies. (Teece, 2007)

Teece (2007) identifies four organizational processes that, when put into place, can help firms to make decisions regarding investment strategies and business models and thus obtain seizing capacities. First, firms need to define a business model appropriate for the new technologies. This includes decisions about product architectures, target customers, sales strategies, approaches-to market, etc.. Selecting the right business model is crucial and analyzing different alternatives, involving external stakeholders and obtaining a holistic understanding of one's supply chain can increase the probability of success. Second, need to implement decision-making mechanisms that enable individuals to make relevant decisions as free of bias as possible. Third, firms need to define their boundaries. This involves decisions about the appropriability regime and complementary assets and requires firms to identify and control 'bottleneck assets'. Fourth, firms need to communicate the inevitable internal changes effectively while acknowledging organizational values and culture.

Finally, asset reconfiguration capacity refers to firms' ability of asset orchestration. New technologies and/or business models will more often than not require the firm to change the way their assets are employed. Failure to do so has the potential to result in internal conflict and to hinder complementarities. As such, continuous mechanisms for asset alignment, realignment and redeployment are required. (Teece, 2007)

According to Teece (2007), this requires the implementation of different organizational processes as well. First, organizational structures should be decentralized in order to endow units with the autonomy required for fast decision making. Second, governance mechanisms aimed at achieving incentive alignment and minimizing agency issues should be implemented. Third, firms should strive for asset co-specialization in order to potentially benefit from synergies. Fourth, firms should develop a cohesive strategy for knowledge management guiding how knowledge is obtained, transferred and integrated internally.

Figure 1 below offers an overview of the dynamic capabilities framework developed by Teece (2007).

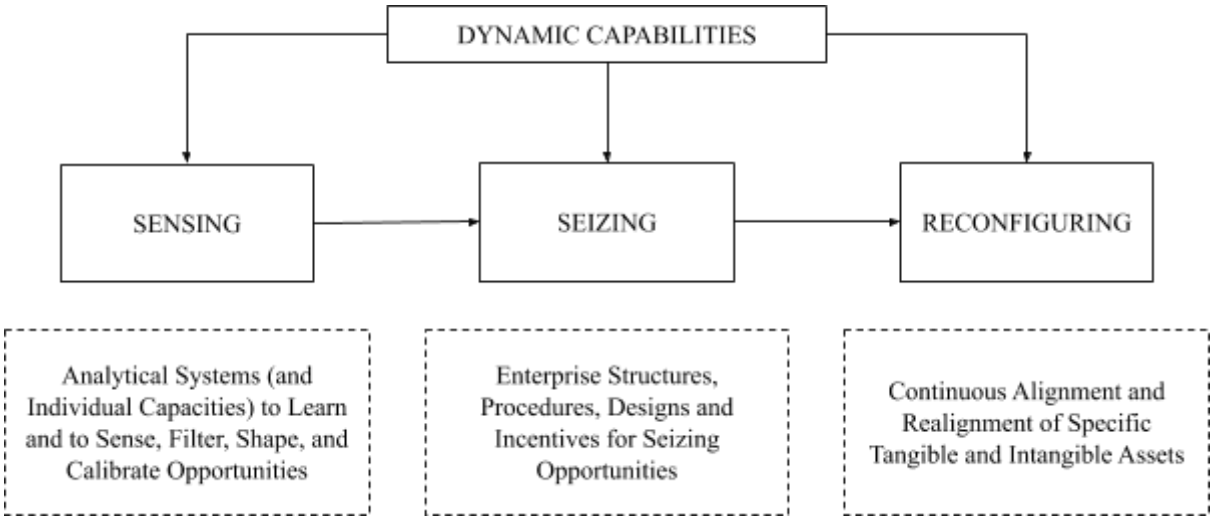

Figure 1: Dynamic Capabilities Framework, adapted from Teece (2007, p. 1342).

In summary, the dynamic capabilities framework introduced by Teece (2007, p. 1346) "highlights organizational and (strategic) managerial competences that can enable an enterprise to achieve [and sustain] competitive advantage" in environments of rapid technological change. It is aimed at both complementing existing research by identifying foundations of long-term economic success and aiding managers by providing a guiding framework for strategic planning.

Research has provided empirical evidence that dynamic capabilities do in fact have a positive effect on both firm performance and a company's survival in changing environments (Cruz-González, Navas-López, Sáez & Delgado-Verde, 2011; Ludwig & Pemberton, 2011; Zott, 2003). However, the effects can be influenced by a variety of internal and external factors, which include the speed of decision making (Ludwig & Pemberton, 2011), the timing of resource deployment (Zott, 2003), the costs entailed (Qaiyum & Wang, 2018, Zott, 2003), learning mechanisms (Zott, 2003), the size and life-cycle stage of the company (Qaiyum & Wang, 2018), and managerial skills (Pablo, Reay, Dewald & Casebeer, 2007).

Finally, a company's dynamic capabilities have been regarded as closely related to its innovation capabilities (Breznik & Hisrich, 2014). This notion was later picked up by

Gazzola (2018) who developed the so-called 'dynamic capabilities innovation cycle'. The framework is built on the idea that companies have to employ both incremental and radical innovation strategies in order to secure long-term competitive advantages. An incremental innovation strategy is favorable when the company possesses a competitive advantage that can be protected by incrementally improving on it. However, this competitive advantage will eventually erode, thus forcing the company to adopt a disruptive innovation strategy in order to create a new competitive advantage. Gazzola (2018) suggests that dynamic capabilities are required for both incremental and radical innovation strategies to be successful, thus supporting the notion that dynamic capabilities and innovation capabilities are closely related. However, the framework also posits that dynamic capabilities are imperative for a company's ability to move from an incremental innovation strategy to a radical one. In summary, "dynamic capabilities allow organizations to create a virtuous circle of best practices and strategic decisions that constantly innovate and reinforce their competitive advantages" (Gazzola, 2018, p. 83).

On top of that, Gazzola (2018) argues that the importance of innovation capabilities (both incremental and radical) and the ability to change innovation strategies is particularly high within sharing economies. Sharing economies are often times based on disruptive innovation triggered through advances in technology. As such, they are usually based on novel business models. Due to this novelty, but also the entailed uncertainty regarding markets and customers, sharing economies are characterized by frequent business model innovations. As a result, companies' ability to innovate on their business model is crucial for their success, thus making dynamic capabilities particularly important in sharing economies. (Gazzola, 2018)

This thesis employs the theory of dynamic capabilities in order to analyze BMW's adoption of carsharing and the entailed business model innovation for a variety of reasons. First, carsharing constitutes a prime example for the sharing economy. As such it is reasonable to assume that dynamic capabilities play a critical role in determining whether a company in the carsharing market will be successful or not. Second, the emergence of carsharing business models constitutes one of several sources of turbulence in the automotive industry (cf. section 2.1 on the automotive industry). As established above, dynamic capabilities are especially relevant in turbulent environments, thus justifying the analysis of carsharing from a dynamic capabilities perspective. Third, the dynamic capabilities framework allows for the

consideration of both internal and external factors, thus allowing for a holistic analysis of BMW's adoption of carsharing. Finally, dynamic capabilities constitute a well established area of research, thus ensuring the relevance of the analysis.

In the next section, two frameworks will be presented that expand on Teece's (2007) dynamic capabilities framework by setting it into two different contexts. On the one hand, Inigo, Albareda and Ritala (2017) investigate the dynamic capabilities required for sustainable business model innovation. On the other hand, Mezger (2014) used dynamic capabilities to explore how companies can innovate on their established business models in an effort to successfully respond to disruptive innovation.

3.2 Mezger's (2014) Dynamic Capabilities Framework

In his 2014 article *'Toward a capability-based conceptualization of business model innovation: insights from an explorative study'*, Florian Mezger investigates the organizational routines and processes firms use in an effort to operationalize business model innovation (BMI). The central argument for the study is that even though BMI's importance as a strategic task has repeatedly been emphasized, research lacks a clear conceptualization of its undergirding organizational processes. This lack, according to Mezger (2014), hinders both a full theoretical understanding of BMI and its application in practice. In an effort to tackle this gap, Mezger (2014) uses multiple case studies of firms employing BMI in the face of digital disruption to develop a conceptualization of BMI based on dynamic capability theories.

The argument for using a dynamic capability conceptualization is as follows. Business models (BMs) represent a firm's approach to value creation, value delivery and value capture based on its resources and competences. If the economic or social environment of a firm is changing, the firm needs to innovate on their BM (i.e. BMI) in compliance with these changes. This can be achieved by either adapting the existing BM or adopting a new BM. As the BM is based on the firm's resources and competences, the required change needs to happen on this level as well. The creation or modification of existing resources and competences requires firms to utilize dynamic capabilities. Thus, engaging in the BMI needed for long-term viability requires dynamic capabilities. (Mezger, 2014)

BMI involves three distinct steps, namely (1) the identification of opportunities for new BMs, (2) the design of new BMs in response to these opportunities, and (3) the implementation of the new BM into the organization (Mezger, 2014). This disaggregation is in line with the dynamic capability framework developed by Teece (2007), who argues that dynamic capabilities consist of capacities for sensing, seizing and reconfiguring. Thus, in the context of BMI, sensing capacities refer to firms' organizational processes aimed at identifying opportunities for new BMs. Seizing capacities refer to firms' organizational processes used for designing viable BMs based upon the identified opportunities. Finally, reconfiguring capacities refer to firms' organizational processes required for the adoption and implementation of the newly developed BM.

The relevant organizational capabilities identified by Mezger (2014) are summarized in figure 2 below.

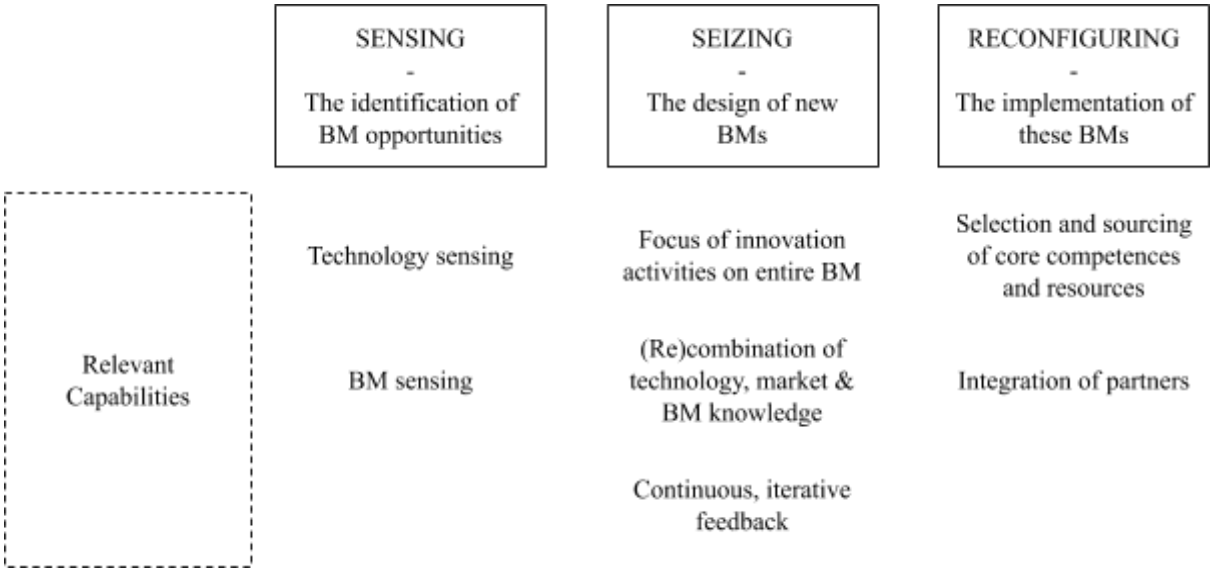

Figure 2: Conceptualization of BMI based on dynamic capability framework, adapted from Mezger (2014, p. 445).

The identification of BM opportunities requires firms to have either technology sensing capabilities or BM sensing capabilities or both. Technology sensing capability refers to a firm's ability to internalize emerging technological knowledge and use this knowledge to systematically identify BM opportunities. The more links a firm has with the external sources

of emerging technologies and the better these links are institutionalized, the better the firm is at identifying opportunities for new BMs. Examples for these links are, among many others, employees with an educational background of work experience in the focal technological field or the knowledge exchange with peers. (Mezger, 2014)
On the other hand, BM sensing capability refers to a firm's organizational processes aimed at the analysis of other firms' BMs. Analyzing the BMs of competitors or of firms in different industries can provide valuable insights of BM opportunities. Thus, the more processes for the recognition, analysis and evaluation of these BMs are in place, the better the firm is at identifying opportunities for new BMs. (Mezger, 2014)

A firm's ability to systematically transform the insights on BM opportunities gathered into actual new BMs is dependent on three distinct capabilities. First, firms need to adopt innovation processes focused on the entire BM. BMs consist of several components and developing a new BM requires simultaneous innovation on several of these components. Thus, having a holistic perspective on the entirety of BM components required is highly beneficial in designing new BMs. (Mezger, 2014)
Second, relying on the knowledge gathered through technology and BM sensing activities alone is insufficient for the development of new BMs. This is due to the fact that as customers engage with new technologies and BMs in their daily lives, they develop certain expectations that may spread to other consumption activities. Thus, customer expectations need to be taken into account during the development of new BMs. In other words, firm's need to combine technology, BM and market knowledge. Market knowledge on customer expectations can, for example, be gathered through the direct or indirect interaction with key target groups. In summary, "firms with frequent and institutionalized processes to get formal and informal customer feedback on existing and emerging business models and customer requirements in emerging markets are better able to generate and advance new business models ideas" (Mezger, 2014, p. 441). (Mezger, 2014)
Third, BMI represents a learning-oriented process based on experimentation. Thus, no 'one size fits all' approach to BMI exists and it is unlikely for a firm to development a perfect new BM first try. Hence, firms need to incorporate continuous, iterative feedback processes into their development of new BMs. This allows for the systematic reconfiguration of the BM in response to additional insights gathered during the process of BMI. (Mezger, 2014)

Finally, a firm's ability to implement a newly developed BM relies on its capability to reconfigure its existing value chain, identify the competences and resources needed for the new BM and source these competences and resources. BMI involves a fundamental change in the way value is created, delivered and captured and is thus likely to render the existing value chain obsolete. As a result, implementing a new BM requires the firm to construct a new value chain. (Mezger, 2014)

On top of that, operating under a new BM is likely to require different competences and resources than operating under the traditional BM. On the one hand, these competences and resources need to be identified, evaluated and selected. It is beneficial for firms to adopt structured processes, for example the mapping of required and existing competences, to do so. On the other hand, firms need to source the required competences and resources. This can be done both internally and externally, with examples for competence acquisition including employee training, recruiting, hiring external consultants, building subsidiaries and acquiring startups. Firms need to assess whether competences and resources are core assets of the new BM and decide on the mode of sourcing accordingly. Sourcing core assets of the BM internally can be beneficial as it maximizes control over them. However, in cases of the new BM being characterized by a high technological uncertainty, integrating external partners with complementary competences and/or resources can be highly beneficial. (Mezger, 2014)

In summary, Mezger's (2014) study offers insights into the organization processes undergirding the different capabilities required for BMI and how firms can operationalize these. It thus provides a "structured approach that is relevant to achieve coordination between different innovation processes that focus on different elements of a business model and avoid failure and harm to overall value creation" (Mezger, 2014, p. 444).

3.3 Inigo, Albareda & Ritala's (2017) Dynamic Capabilities Framework

In their article: *'Business model innovation for sustainability: exploring evolutionary and radical approaches through dynamic capabilities'* Inigo, Albareda & Ritala (2017) present a framework which provides insights on how managers and entrepreneurs engage in business model innovation while incorporating environmental and social aspects for value creation. Following the traditional paradigm, sustainability dimensions do not integrate well with profit

seeking, thus it is not easy to implement it for the first time in a company. On the contrary, increasing examples of sustainability well implemented in the core activities of firms, support the idea that sustainability can now be a competitive advantage rather than a burden. Its value does not come from one activity or one part of the company like other traditional competitive advantages might work, instead it comes from integrating economic, social and environmental performance, through a transformation of the core operations in a firm, i.e. the business model. The successful integration of the many contexts involved and implementation of the many dimensions of sustainability results in a BMIS (business model innovation for sustainability).

The main aim of this framework is to study how companies build and organize new organizational capabilities, routines and processes to identify, design and develop BMIS.
Starting from Teece's framework, Inigo, Albareda & Ritala (2017) modeled this framework in order to study the business model transformation for sustainability and the capabilities needed to achieve such feature. They focus on the business model because it reflects the internal activities of the company and represents a bridge between the firm's internal capabilities and how these relate to its ecosystem, including suppliers, customers and other stakeholders.

In the framework, BMI is a set of microfoundations for dynamic capabilities, but at the same time, BMI is a dynamic capability and requires other dynamic capabilities because it involves major changes in the overall value chain structure. In fact, the key dimension of a successful BMI is the transformation in organizational and managerial capabilities. BMIS on the other hand, has the added complexity of taking many more factors into account, including the society and the environment as external stakeholders. This results in a more complicated relationship between the various factors and requires a stronger managerial vision and organisational capability for the transition to be successful.

The framework begins by identifying two different categories with which classify BMIS.
The first case is the evolutionary BMIS, which as already stated in (paragraph THEORY) is characterized by incremental developments in the activities of the company and its existing BM in order to implement sustainability-related changes in the procurement of resources, in capabilities or in ordinary business operations. This approach is used by companies that want

to respond to sustainability trends and address new consumers needs, in order to enter new markets or to engage in sustainability as a company effort.
The second category identified is radical BMIS, which is characterised by the development of a new solution to an already known problem or a solution for a new challenge. This approach changes drastically the BM and introduces a new value proposition, value creation and value capture in the market. Voelpel et al. 2004, argue that this approach is often used to remove the company from a previous unsustainable lock-in that was present in the market. The result is so different from the company old BM, that many times firms experiment with the implementation of these new models through spin-offs in order to offset the risk of failure.

This framework, after dividing BMIS in two categories, develops the dynamic capability theory of Teece which consists in the capacity of sensing, seizing and reconfiguring.
"Sensing" means having the ability to recognise global megatrends and business opportunities (e.g. customer needs, competition and technology) that are relevant to the firm, "Seizing" refers to the ability to operationalize the knowledge gathered after detecting opportunities and threats, then developing existing BMs or creating new BMs in a combination of technological, market and BM knowledge through a process of continuous learning. "Reconfiguring" is the ability to build new competencies and implement organizational renewal, which are required for the ongoing BMI.
Each of the three capabilities is implemented in the transformation with three key processes which vary depending on the category, evolutionary or radical BMIS.

The capabilities for evolutionary BMIS, are connected to the need to develop an approach to incrementally move toward a systemic and sustainability oriented development of the company.
Sensing involves *(1) the gradual integration of stakeholders and triple bottom-line objectives of the business model, acquiring the necessary technologies and techniques for sustainability that must be matched by the BMIS,* which means that the company must establish communication channels with stakeholders in order to gather the relevant knowledge to match the BMIS. The authors recommend informal communication and collaboration with institutes that can provide scientific knowledge. The second key process is: *(2) being responsive to the firm's external environment, particularly the social and environmental*

regulations, by proactively seeing regulatory changes as opportunities. The authors recommend a tight communication between monitoring and development team in order to develop the right BM before the changes come into effect. The last process, *(3) complying with regulations and being open to external stakeholders that introduce sustainability concerns and ideas,* suggests a collaboration with sustainability associations. One example is the cooperation with an eco-design association to understand how to improve the BMS (Inigo et al., 2017 p.532).

Seizing is the process of bringing into action what has been learnt in the previous activity. The first step is *(4) integration of clean technologies and sustainability-oriented methodologies,* aims at reconciling the acquired knowledge on methodologies and technologies with the BMIS development. The next step *(5) knowledge dissemination to design new sustainable products, services and processes,* is the process of spreading the new knowledge to employees and engaging them in the company sustainability transition in order to better leverage the information acquired in the previous activity. The final step is to *(6) partner with new organisations,* to fill the knowledge gaps and establish long term alliances in order to be able to continuously improve the BMIS (Inigo et al., 2017 p.532).

The last activity in the incremental transformation for sustainability is to reconfigure the firm's assets. The first step is *(7) spreading the sustainability mindset across the organisation,* as in giving sustainability-centered tasks throughout all the departments. The second step is *(8) decentralising knowledge and innovation and sustainability teams due to the transversal nature of sustainability matters,* being sustainability innovations holistic and systemic in nature, the innovation process is enhanced when all the teams are committed to it. The last step, *(9) building trust and commitment to the company goals throughout the organisational levels,* is essential to support a more horizontal structure and creating a sense of belonging and trust enables the employees to be more open to BMIS and to learn new capabilities (Inigo et al., 2017 p.533).
The overall process builds coordination and awareness of the company's effort toward sustainability, while it also decentralizes the innovation process and creates mutual trust between the teams to achieve cross-department cooperation.

The capabilities for radical BMIS are connected to the need of creating socio-technical, system-level transformations and proactively change the industry and the company environment through path-creating business model designs.

The first step of "sensing", is the process of *(1) establishing open dialogues with disruptive social and environmental stakeholders* in order to acquire the necessary knowledge and empathize with new trends that go against the established BMs. This is done due to the limited examples in the industry for this kind of innovative BM designs. The second step *(2) focusing attention on systems-based sustainability challenges and trends and collective solutions,* stresses the importance not only to respond to customer needs, as it is done in step one, but to explore industry challenges and respond with disruptive BMIS. This also entails educating clients and competitors about the industry challenge and the new solutions. The last sensing capability is the *(3) search for new sustainable technologies to transform the markets towards sustainable developmental changes.* The authors stress that the search for clean technologies is usually associated with the development of disruptive BMIS to complement the technology and that these innovations often create new markets (Inigo et al., 2017 p.534).

"Seizing" is the step of taking action on the knowledge gathered. The first capability *(4) adopting a socio-technical system-based approach to sustainability-oriented innovation,* meaning that the knowledge gathered will be seen as influencing the whole company and its stakeholders, not only one department. The next step *(5) focusing the BMIS on sustainable development and customer goals,* is the ability of the company to act as an activist which aligns customer needs and consumption with sustainable development. Guiding consumers toward sustainability and responsible consumption often results in servitization rather than sales of a product. The last step of "seizing" is *(6) including inter-partner learning and co-creation through complementary knowledge on social, environmental and economic matters.* Contrary to the evolutionary BMIS, the collaborations and alliances established in the radical BMIS do not aim at filling skills or knowledge gaps, but are an opportunity of mutual learning and co-creation where new structures and capabilities are created for the BMIS (Inigo et al., 2017 p.535).

Finally, the last activity is to reconfigure the firm's resources and capabilities. The first capability is *(7) managing sustainability goals at all layers of the organisation and sharing*

responsibilities for collective decision-making and governance towards BMIS, which creates trust, sense of belonging and space for discussion and ideas coming from all levels of the organization. The second capability is *(8) promoting creative and disruptive sustainability-oriented innovation teams, even generating new spin-offs.* Based on the knowledge acquired, the company should encourage teams to work on disruptive innovations and eventually create a spin-off to increase agility and offset the risks. The last capability is *(9) using an integrated approach to sustainability-oriented innovation and value chain management,* because of the rapid changes, collective decision making ensures shared responsibility and acceptance of the future changes (Inigo et al., 2017 p.535).

	Evolutionary BMIS	Radical BMIS
Capabilities	Key Processes	Key processes
Sensing	(1) Hold stakeholder dialogues (2) Anticipate and respond to regulations (3) Create and network in sustainability related associations	(1) open dialogues with critical and disruptive social and environmental stakeholders (2) Focus attention on socio-technical system-based sustainability challenges, trends and collective solutions (3) Search new technologies to transform the markets for sustainable development
Seizing	(4) Integrate clean technologies and sustainability-oriented methodologies (5) Integrate knowledge from stakeholders with sustainability and disseminate it throughout the company (6) Partner with new organizations	(4) Adopt a system-based transformation approach to advanced sustainability-oriented innovation (5) Focus BMIs on sustainable development and customer goals (6) Implement inter-partner learning and co-creation
Reconfiguring	(7) Build decentralised sustainability-oriented innovation teams (8) distribute knowledge management and governance (9) Create trust and commitment among internal teams	(7) Promote creative and disruptive sustainability-oriented innovation teams and even generating new spin-offs (8) Develop an integrated approach to sustainable innovation and value-chain management (9) Manage collective decision-making and governance

Figure 3: Conceptualization of evolutionary and disruptive BMIS based on dynamic capability framework, adapted from Inigo, Albareda & Ritala (2017, p. 530-531).

3.4 Research Questions

As stated above, the aim of this thesis is to bridge the gap between disruptive innovation research and eco-innovation research by developing a framework for eco-disruptive business model innovation using a dynamic capabilities perspective. For this purpose, the following research question was identified:

How is a company able to innovate its BM when faced with eco-disruptive innovation?

- What sensing, seizing, reconfiguring processes does a company need to implement for the Business Model Innovation?
- How are these processes implemented?

This thesis seeks to answer the above questions by analyzing the case of BMW - and particularly BMW's adoption of carsharing business models - as a case.

The first sub-question is of a descriptive type, which encourages the presentation of the relevant data:

> *What sensing, seizing, reconfiguring processes does a company need to implement for the Business Model Innovation?*

It narrows down the scope of the thesis by focusing the research on the processes, while the language of the question is the framework's, which allows for an easy comparison of the data with the framework taxonomy.

The second sub-question is used to allow for a deeper investigation of the processes:

> *How are these processes implemented?*

With "these" the question addresses the processes that were described in the first question. The aim of this question is not merely to show the implementation according to the frameworks description, but to investigate how BMW actually implemented the processes and, if necessary, explain the implications of the specific synergies and effects of such implementations.

The exact procedure followed in the thesis is demonstrated in the methodology section, succeeded by a presentation of the relevant data gathered in the analysis section. Finally, this data is used to answer the research questions, with the generated answers being subsequently

employed to derive a framework detailing the dynamic capabilities required for eco-disruptive business model innovation. This framework is presented in the discussion section of this thesis.

4 METHODOLOGY

The results obtained and conclusions drawn from research only represent a meaningful addition to existing knowledge if they are both comprehensible and replicable. As such, proper research needs to include a detailed account of the way it was conducted, i.e. the methodology of the research, and cohesive arguments of why it was conducted in that way (Saunders, Lewis & Thornhill, 2009). This section will provide such an account with the goal of endowing the results of this thesis meaning in a broader academic context. It is split into different subsections adapting the methodological considerations of a variety of scholars, most notably Crotty (1998), Flick (2010), Saunders et al. (2009), and Yin (2003).

4.1 Epistemology

Epistemology is concerned with the nature of knowledge and, as such, represents researchers' philosophical understanding of what constitutes knowledge and how it can be developed (Crotty, 1998). Researchers' epistemological position has severe implications on the adequacy of different methods and strategies, thus influencing how research is conducted and how its results are presented (Crotty, 1998). Consequently, the results research yields can only be interpreted in a meaningful manner if the researchers' underlying assumptions in terms of epistemology are understood. For this reason, the following paragraph will outline the epistemological position this thesis is based upon.

This thesis is based on the epistemological position of social constructivism. It denies the existence of objective knowledge by arguing that all knowledge is subjectively constructed by social actors. In particular, knowledge is constructed through these actors interacting with their external world, with different perceptions resulting in different interpretations (Crotty, 1998). On top of that, these interpretations are likely to affect the behavior of the social actors (Saunders et al., 2009). Finally, while social constructivism posits that knowledge is constructed through social interaction, it also acknowledges the effect of culture as a predisposition influencing this social interaction (Crotty, 1998).

The epistemological position of social constructivism constitutes an appropriate position for this thesis. This thesis investigates the dynamic capabilities involved in business model innovation as a response to eco-disruptive innovation. Particularly, these dynamic capabilities

consists of sensing, seizing and reconfiguring, which necessitates the gathering, interpretation and implementation of new knowledge. Yet no objective blueprint for this exists. Rather, different social actors gather and implement knowledge differently depending on their subjective interpretations of said knowledge, with these interpretations being shaped by context specific factors. This is in line with social constructivism, which posits that different actors interpret reality differently, resulting in differing behavior. In conclusion, adopting the position of social constructivism acknowledges the subjectivity of knowledge, thus enabling the meaningful analysis of the diverse and context-specific processes employed for business model innovation.

4.2 Theoretical Perspective

The underlying epistemological position has distinct implications for the theoretical perspective of research, i.e its logic in terms of understanding and explaining phenomena (Crotty, 1998). This thesis is built on the theoretical perspective of interpretivism. Interpretivism advocates the notion that reality is socially constructed and thus subjective. As such, it can be seen as a natural extension of the epistemological position of social constructivism (Crotty, 1998; Saunders et al., 2009). On top of that, interpretivism argues that due to the subjectivity of reality, every interpretation of it is highly context specific.

Interpretivism does not only constitute a natural extension of social constructivism. It also represents the appropriate perspective for this thesis because the theories predominantly used in this thesis - i.e. disruptive innovation theory, eco-innovation theory and dynamic capabilities theory - all emphasize the high importance of context, in particular changing economic environments. Without acknowledging the effects that context has within business model innovation, the subsequent analysis and discussion are unable to contribute to the development of said theories. Thus, it would result in a failure to meet the defined goal. Adopting an interpretivist perspective and consequently acknowledging the effects of context-specific factors, however, enables the conclusions drawn within this thesis to contribute to the development of its underlying theories in a meaningful way. Hence, it allows this thesis to achieve its goal.

4.3 Research Approach

In terms of research approaches, it is often differentiated between research that tests existing theory through the collection and analysis of data - i.e. deduction - and research that uses data to derive new theory - i.e. induction (Saunders et al., 2009). The approach used in this thesis classifies as deductions. It is built on the proposition that existing theories in the field of business model innovation, in particular disruptive innovation theory, eco-innovation theory and dynamic capabilities theory, may potentially be insufficient for explaining eco-disruptive business model innovation. Subsequently, this proposition is tested through the collection and analysis of data. If the proposition is confirmed, the findings are then used in order to modify the theories.

It is the ambition of this thesis to bridge the gap between disruptive innovation theory and eco-innovation theory by investigating the dynamic capabilities involved in eco-disruptive business model innovation. This requires the confirmation of the aforementioned proposition that existing theories insufficiently explain said business model innovation. Subsequently, the insight obtained while investigating this proposition are used to inform existing theories and finally bridge the gap. Thus, this thesis is only able to achieve its goals in a meaningful manner through the adoption of a deductive approach.

4.4 Research Strategy

This thesis uses a case study strategy, which can be defined as the analysis of a phenomenon within the context of a particular case. As such, there is no clear distinction between the phenomenon itself and the context it is studied in. A case study strategy is especially useful for gaining an understanding of the context and its underlying dynamics. It allows for the use of a variety of methods (i.e. data collection techniques), both individually and in combination. As a result, case studies often times employ triangulation, or the use of different sources of data within one study, in an effort to increase the meaningfulness of results. Finally, case studies can be classified according to two dimensions, the number of cases (single vs. multiple) and the unit of analysis (holistic vs. embedded). (Saunders et al., 2009; Yin, 2003)

A case study strategy was adopted due to its strong emphasis on context. As argued above, the acknowledgement of context-specific factors is crucial for this thesis. Case studies are concerned with obtaining a holistic overview of a particular case, which usually includes an investigation of its context. Thus, it constitutes a fitting strategy for the purposes of this thesis.

The case used is that of the BMW Group. Particularly, the different activities the BMW Group has undertaken or participated in in order to commercialize mobility service business models are investigated. As such, the strategy used can be classified as a single, embedded case study. Initially, the analysis of several cases was planned. However, BMW was the only car manufacturer willing to provide access and upon investigation a two case study approach would have required less depth in the analysis due to the limited amount of pages of the thesis.

4.5 Research Design

The research design represents a blueprint of research which deals with four problems: what question to study, what data are relevant, what data to collect and how to analyze the results (Yin, 2003). It is a logical plan with the purpose to ensure that the evidence gathered addresses the research question. The research design for case studies features five main components: (1) the research question, (2) the propositions, if relevant, (3) the units of analysis, (4) the logical link between the data and the proposition and (5) the criteria for interpreting the findings (Yin, 2003). In the case of an exploratory study, instead of propositions the researchers have to state the purpose of the exploration and the criteria by which the exploration will be deemed successful.

While designing the research, an essential step is to develop or test theories. These should embody the research design points and create a theoretical proposition of the expected outcome of the research. For exploratory case studies it is hard to create theoretical propositions, nonetheless the researchers should specify what it is to be explored, the purpose of the exploration and criteria of successful exploration. (Yin, 2003)

4.5.1 Research Question

The research question is used to clarify the nature of the research. The use of "how" and "why" questions are most likely to turn to a case study research. (Yin, 2003)

The research question for this master thesis and its sub questions, have been chosen to specify the nature of the research:

How is a company able to innovate its BM when faced with eco-disruptive innovation?

- *Does the case of carsharing constitute an eco-disruptive innovation?*
- *What sensing, seizing, reconfiguring processes did they implement for the Business Model Innovation?*
- *How do these processes compare to those reported in the analytical frameworks?*

While the main question specifies the nature of the research as innovation processes in specific settings, the sub questions gradually constitute the basis for the research, starting from defining a fitting BM to analyze, then describing the evidence that has to be researched and finally setting up the basis for pattern comparison.

4.5.2 Object of Exploration

The statement of propositions are not fitting for exploratory case studies. Instead the object and purpose of the exploration must be explained. (Yin, 2003)

The object of exploration within this thesis are the dynamic capabilities involved for companies innovating on their business model in order to commercialize eco-disruptive innovation. Disruptive innovation theory and eco-innovation theory have been chosen as starting point of the exploratory research because of their inherent value in the present economy and their expected increase in value in the near future, supported by the increasing interest of both academia and companies in these two phenomena. The assumption of the exploration is that the current theories fail to fully describe the case at hand. Namely, the two analytical frameworks that have been chosen to analyze the case addresses only one phenomena each and fail to incorporate the implications of the phenomena happening at the same time.

4.5.3 Unit of Analysis

The unit of analysis represents the fundamental problem of defining the case to be analyzed and narrow down the scope of the research question as different units of analysis call for a

different research design and data collection strategy. The selection of the unit of analysis will be defined by the research questions and by similar prior research to allow for comparison. (Yin, 2003)

The chosen unit of analysis, dynamic capabilities, reflects the wording of the research question and is the result of the literature review. Dynamic capabilities is in fact the theory that has been identified as a potential link between the two types of innovation. The focus of the research us thus on the processes adopted by the company in the specific context of the case study. As such the unit of analysis represents a perfect match between the previous research, the theoretical framework and the research question of the master thesis.

4.5.4 Linking Data to Exploration

For an exploratory case study research it might be difficult to generate theoretical propositions. In this case, researchers should state the object of research, the purpose of the research and the quality criteria for a successful research. (Yin, 2003)

As explained above, the purpose of the research is to explore the relationship and implication of eco and disruptive innovation on companies seeking to transition to a new BM. The theoretical propositions underlying this case study research are (1) that eco and disruptive innovation are connected and affect the transition of companies into new BM in a new way, (2) that carsharing provides as valid case for such research and (3) that the synergies and implications of process of the case analyzed will not be entirely described by the existing frameworks, thus requiring the development of a new framework.

The first theoretical proposition is answered through the literature review, while the two remaining will be tested in the discussion.

4.5.5 Criteria for Interpreting the Findings

The problem of interpreting the data does not have a precise way of setting criteria to perform such task. The hope is that the comparison will yield a better match in one case than the other (Yin, 2003). In the case of this thesis, the data will be compared to one framework at the time. The frameworks describe a certain scenario and the synergies of processes applied to those scenarios. The interpretation of the analysis will be based on the ability of the framework to describe the processes and their implementation. The success of the research will be reached in two different cases. The first case will occur if the third theoretical

proposition is proved wrong and the two frameworks suffice at describing the synergies of the processes at hand. The second occasion will occur if the third proposition is in fact correct and the researchers manage to develop a new framework that fully describes the synergies and implementations of the processes analyzed.

4.6 Methods

This thesis uses document analysis in order to obtain the data necessary for analyzing the case at hand and subsequently developing a framework of the dynamic capabilities involved in eco-disruptive business model innovation. The following sections describe how data was collected, codified and prepared for analysis.

4.6.1 Data Collection

First, secondary data in the form of previously conducted research was gathered through in-depth literature reviews of existing research on the various topics presented in this thesis. This included previous research, both general and automotive industry specific, into disruptive innovation, eco-innovation, business model innovation and dynamic capabilities. The previously conducted research was identified by using relevant keywords within the database Business Source Complete[2].

Second, an initial interview with a key informant in the field was held in order to get first insights into automotive and mobility services industries. This was particularly useful, as it provided guidance and structure to the subsequent collection of documents. The interview was semi-structured and held with Marcus Krieg, at the time BMW's Head of Mobility Services, was conducted. With more than 20 years of experience working for BMW, particularly in the areas of on-demand mobility and mobility services, Mr. Krieg was able to provide detailed accounts of BMW's adoption of carsharing over the years. On top of that, he was able to give insights into the tensions between BMW's manufacturing business units and the business units and subsidiaries aimed at offering carsharing services.

The interview was held on the 2nd of May 2019 in the BMW offices in Munich, Germany, with one of the researchers being personally present and the other joining via Skype. It was

[2] Cf. https://www.ebsco.com/products/research-databases/business-source-complete (Retrieved 17.08.2019).

recorded so that the interviewers were able to fully concentrate on the answers given and to ask follow-up questions. The interview involved questions regarding BMW's initial decision to adopt carsharing, the development of DriveNow, and the strategic vision of BMW. On top of that, it also included questions on the automotive industry in general, particularly with regards to the potential paradigmatic shift towards shared, electric, autonomous mobility. The interview was semi-structured, meaning that it consisted of open-ended questions and allowed for additional questions to be asked. This inherent flexibility allowed gaining an understanding not only of what had happened, but also of the motivations behind and the attitudes towards what happened. As such, it provided a good understanding of the context as well as a historical account, thus complementing this thesis' case study strategy (Saunders et al., 2009). Additionally, enabling the interviewee to provide answers not in line with current academic research was crucial due to the under-studiedness of the research topic.

Finally, textual documentation regarding BMW's business model innovation process, particularly their adoption of carsharing, was collected from a variety of sources. This was done using the following steps. First, a set of keywords was derived from both the initial literature reviews as well as the interview. These were then entered into the search engine Google.com[3] as EBSCOhost databases provided no result or irrelevant results for the majority of the keywords (mostly results about awards given through BMW's Supplier Innovation Award). Subsequently, all results containing textual documents (e.g. newspaper articles or blog posts) relevant to this thesis' analysis were extracted. However, documents from the BMW website were neglected, as they were mainly focused on the recent partnership with Daimler to form ShareNow. These documents were considered to support the explanation of the interview and mainly discussed the future strategy of BMW and Daimler instead of the processes. This process of gathering documents yielded more than 120 documents. In a next step, the documents were screened for relevance and repetitions. Relevance refers to the fact that only documents giving insights into BMW's processes toward gathering knowledge for and developing mobility services were considered. On top of that, repetition refers to the fact that all duplicates and links leading to documents already in use were excluded. This screening process ultimately resulted in 53 usable documents that each have been matched

[3] Cf. https://www.google.com (Retrieved 30.08.2019)

with a unique code. A table of this can be found in the bibliography. An overview of the used keywords as well exemplary links is provided in table 1 below.

Keywords	**Exemplary Links**
BMW business model innovation	https://www.finchandbeak.com/1048/sustainable-innovation-bmw-business-model.htm
BMW innovation process	https://www.steelcase.com/research/articles/topics/innovation/bmw-driving-innovation/
BMW innovation history	https://www.ft.com/content/c6fe4eae-4153-11e3-9073-00144feabdc0
BMW innovation	https://thenextweb.com/tnw2019/2019/04/26/how-bmw-is-innovating-its-business-to-build-cars-for-the-future/
BMW sustainability innovation	https://www.basf.com/global/en/media/news-releases/2018/11/p-18-387.html
BMW sustainability	https://www.wearesalt.org/bmw-the-most-sustainable-corporation-in-the-world-according-to-corporate-knights/
BMW carsharing	https://www.geekwire.com/2019/bmw-reachnow-shuts-car-sharing-service-seattle-portland-following-joint-venture-deal/
BMW carsharing innovation	https://www.autovistagroup.com/news-and-insights/sixt-plans-enter-car-sharing-market-following-sale-its-stake-drivenow
BMW carsharing innovation history	https://www.cleanenergywire.org/dossiers/energiewende-and-german-carmakers
BMW carsharing innovation process	https://rethink.beta-i.pt/2017/03/29/corporate-innovation-company-can-learn-bmws-innovation-strategy/

Table 1: Overview Keywords & Exemplary Links

Documents can be defined as all records produced in a standardized way, e.g, notes, reports, statistics, certificates etc. (Flick, 2010). The main advantage in using documents lies in their potential to “provide a new and unfiltered perspective on the field and its processes” (Flick,

2010, p. 261). This is due to the fact that they were initially produced for other purposes. As such, they allow researchers to gain an understanding of the topic in question that transcends the established academic understanding. On top of that, not being recorded for the specific research purpose results in them providing a holistic overview of the context around the topic in question. This thesis' main goal is to close a gap in current research by bridging disruptive innovation theory and eco-innovation theory. Thus, not being confined by the established understandings within these two fields proved highly beneficial. Additionally, the provided context proved valuable in understanding the relationships between different activities by BMW and both internal and external results. For these reasons, document analysis was chosen as the main means of collecting data. However, the fact that documents are usually produced for different purposes is often criticized as it can result in them being biased. In order to account for that, a large variety of documents from all kinds of sources was considered, thus minimizing the threat of focusing on individual, biased opinions.

The predefined interview question and the transcribed interview as well as a list of all textual documents identified can be found in the appendix of this thesis.

4.6.2 Data Codification

In order to reduce data complexity and thus facilitate the subsequent analysis, the data was codified using the method of content analysis (Flick, 2010). Content analysis refers to the utilization of predetermined categories, usually derived from theoretical frameworks, in order to systematically classify the gathered data (Flick, 2010). As previously established, this thesis employs the dynamic capabilities frameworks developed by Mezger (2014) and Inigo et al. (2017) respectively. Both of these frameworks are built on Teece's (2007) dynamic capabilities framework and its taxonomy. In particular, they distinguish between three categories of dynamic capabilities, namely sensing, seizing, and reconfiguring. As this thesis aims at developing a new dynamic capabilities framework that also employs Teece's (2007) taxonomy, using content analysis constituted a logical choice for data codification. Particularly, the transcribed interview and all documents were codified using the software NVivo[4], with all evidence for dynamic capabilities displayed by BMW being grouped into

[4] Cf. https://www.qsrinternational.com/nvivo/home (Retrieved 30.08.2019)

either sustainability sensing, sustainability seizing and sustainability reconfiguring (referring to the framework developed by Inigo et al. (2017)) or technology sensing, technology seizing and technology reconfiguring (referring to the framework developed by Mezger (2014)). For example "*Additionally, the BMW Group has founded a research center for urban mobility, with comprised of a variety of experts from different fields. The joint task of the team is to engage with leaders of big cities and analyze their needs. This is at the prerequisite for developing new urban mobility solutions together with cities"* (D20) has been codified as sustainability sensing because if falls under the categorization of the processes of Inigo et al. (2017) framework especially with the process definition *"establishing open dialogues with disruptive social and environmental stakeholders"* (ibid, p 534), while *"We track which functions people use and we can analyze every experience. Then, we decide whether we should keep a function, improve it, or take it out. If a function is not used, we take it out"* has been codified as seizing according to the framework of Mezger (2014), as it represents an example of the process that BMW utilizes to get continuous feedback and test the performance of its solutions.

An overview of the nodes used for codification as well as the distribution of the evidence found is presented in Table 2 below.

Nodes	**References**
Inigo et al. (2017)	94
● Sustainability Sensing	40
● Sustainability Seizing	25
● Sustainability Reconfiguring	29
Mezger (2014)	142
● Technology Sensing	46
● Technology Seizing	42
● Technology Reconfiguring	54

Table 2, Nodes of Codification & Distribution of Evidence

4.6.3 Data Analysis

Due to its deductive nature, i.e. its strong reliance on priorly developed theory, this thesis employs the analytical procedure referred to as explanation building. This approach is characterized by the following steps: (1) the identification of an initial theoretical framework, (2) the gathering of data through case studies, (3) the comparison of the theoretical framework and the data obtained, and (4) the adaptation of the theoretical framework in the light of the findings from the comparison (Yin, 2003). The theoretical frameworks identified are Mezger's (2014) framework of the dynamic capabilities for business model innovation in the light of disruptive innovation and Inigo et al.'s (2017) framework of the dynamic capabilities for business model innovation in the light of eco-innovation. These frameworks are applied to BMW's mobility services initiatives, based on the proposition that they are insufficient to explain the observed dynamics. If this proves valid, a new framework of the dynamic capabilities for eco-disruptive business model innovation is proposed in the discussion section of this thesis.

The process of explanation building traditionally supposes the testing of the adapted or newly developed theoretical framework through the investigation of further cases (Saunders et al., 2009; Yin, 2003). However, this would go beyond the scope of this thesis.

4.7 Rationale

The above sections present the decisions made in this thesis with regards to the used methodology as well a justification of those decisions. However, this does not include a justification for the chosen frameworks or case. These are provided in the following section.

For the purpose of this thesis, two existing dynamic capabilities frameworks have been presented. The framework developed by Mezger (2014) was used as it presents an in-depth investigation of the dynamic capabilities involved in disruptive business model innovation. The framework developed by Inigo et al. (2017) was used as it, in turn, presents an in-depth investigation of the dynamic capabilities involved in sustainable business model innovation. Finally, the two frameworks were chosen as they both build on the same taxonomy of dynamic capabilities developed by Teece (2007), thus facilitating a comparison.

Additionally, analyzing the dynamics of eco-disruptive innovation within the automotive industry was chosen for two distinct reasons. First, it currently faces the threat of being disrupted by new technologies such as electric vehicles, digital carsharing platforms, and autonomous driving. Second, it is also characterized by high levels of environmental regulation and customers' increasing demand for sustainable mobility solutions. Finally, analyzing the automotive industry may have significance for other manufacturing industries. In particular, the case of carsharing business models was chosen as a case for business model innovation within this industry. Electric vehicles do not require any major business model innovation and as such are unsuited for this analysis. Autonomous driving has the potential to entail such business model innovation, yet the technology has not matured enough to allow for any meaningful analysis. Carsharing business models however not only represent a business model innovation mature enough to allow for a meaningful analysis, but it is also likely to possess the characteristics of both disruptive innovation and eco-innovation. Thus, carsharing was chosen as the case for this thesis. On top of that, carsharing constitute a prime example of sharing economies. As a result, the conclusions drawn in this thesis are likely to be relevant for other sharing economies as well. It is worth noting that carsharing is closely tied to the developments within electric vehicle and autonomous driving technologies. Electric vehicles are already used extensively within carsharing fleets, thus furthering the sustainability aspect of carsharing. Also, it is expected that the large scale adoption of carsharing is reliant on mature autonomous driving technologies. As a result, both electric vehicles and autonomous driving are considered within this thesis.

The case of BMW was chosen for a number of reasons. First, BMW represents one of the biggest, oldest and most commercially successful car manufacturers in the world. As such, it constitutes a meaningful and representative example for the entire industry. Second, BMW has positioned itself as a top innovator within the automotive industry, thus representing an extreme example. As such, it has proactively fostered innovation in the mobility services sector for years. This can be seen in its adoption of the carsharing business models in a variety of ways, with the majority of initiatives being commercially successful. As such, the analysis of BMW's carsharing initiatives provides a holistic overview of how established companies can innovate on their business models. Additionally, the versatility allows for the comparison to a variety of other carsharing providers. Finally, the business models employed

in BMW's core business units are vastly different from the ones used in its carsharing initiatives . As such, most of BMW's carsharing initiatives represent a radical business model innovations. This is critical for the subsequent analysis and consequently yet another reason for the choice of BMW as a case for this thesis.

4.8 Quality Criteria

In order for this thesis to prove as a valuable addition to research, certain quality criteria have to be fulfilled. Generally, the quality of any research can be assessed by answering questions about its truth value, applicability, consistency, and neutrality (Lincoln & Guba, 1985). How these can be answered is thereby strongly influenced by the methodological considerations made.

This thesis uses the considerations made by Lincoln & Guba (1985) to assess its quality. The authors suggest the criteria credibility, transferability, dependability and confirmability to answer the questions about the truth value, applicability, consistency and neutrality respectively. First, credibility refers to whether the arguments made within this thesis can be considently trusted. In order to ensure credibility, this thesis provides a detailed documentation of the methodological considerations made, particularly in terms of how data was gathered and analyzed (Yin, 2003).

Second, transferability refers to whether this thesis' findings can be applied to other contexts (Lincoln & Guba, 1985). Again, a detailed documentation of the methodological considerations made as well as access to all data gathered is provided in this thesis in order to ensure transferability. Case study strategies have often been criticized for inherently lacking generalizability (Yin, 2003), i.e. the applicability to other contexts. However, Yin (2003) argues that the aim of case studies is not to provide statistical generalizability but analytical generalizability. This refers to its results being generalizable to the theory under study rather than to a defined population of samples. In order to ensure this analytical generalizability, in-depth literature reviews and a holistic discussion of the theoretical frameworks and their place in wider dynamic capabilities research have been provided[5].

[5] Cf. Sections 2 & 3

Third, dependability refers to whether a sound methodology was used, thus enabling the research to be replicated (Lincoln & Guba, 1985). This can be ensured by having external researchers peer review the process, which was done as part of the supervision of this thesis.
Finally, confirmability refers to whether other researchers could confirm the findings, thus accounting for the authors' biases (ibid). This can not be assessed within this thesis, as it builds on the epistemological position of social constructivism. This posits that reality is subjective, with individual social actors interpreting it differently and acting differently based upon their interpretations.

4.9 Research Limitations

First of all, the research was intended to be a multiple case study based on interviews with BMW and Daimler as case companies. Due to the difficulty of organizing interviews with both companies, the research design has transitioned to only one case company, BMW. Gathering data through multiple interview was not possible since BMW's employees refused to collaborate and did not allow the researchers to organize interview. The method of document analysis was thus chosen as an alternative. In a research where the processes enacted and the context of such processes is crucial for the analysis, interviews would have provided a more complete narrative and logical explanation of such processes and the motives behind their implementation. Moreover, the utilization of one single case company reduces the ability to generalize the findings and needs the support of other case studies to eliminate the bias of the context of the company analyzed.
Secondly, carsharing as a business model has not been agreed to be disruptive nor eco-sustainable as an innovation by the previous literature. This is important as it is the thesis' basis that the case can be analyzed with a eco-disruptive innovation lens. The problem concerning the correct categorization of carsharing is mainly that it is a rather new BM and is still developing, taking different forms and as such its adoption is not widespread. In order for it to be agreed to be disruptive and eco-sustainable without exceptions, the BM needs to mature and needs mainstream adoption, thus only time will tell. This issue is further discussed in the discussion section 6.1.
Third, the questions raised by the research question will be answered only to the extent of the processes identified in BMW's BM innovation. The answers are further limited to the extent

of the available data gathered which does not encompass all the processes of BMW's but only the one most closely related to the keywords used for the search.

5 ANALYSIS

5.1 Introduction to the BMW Group

The Bayerische Motoren Werke AG - or BMW - was founded in 1916 as an engine manufacturer in Munich, Germany. More than one hundred years later, BMW today represents one of the biggest premium car manufacturers worldwide. In 2018, the company generated almost 100 billion Euros in revenue and employed more than 130 thousand people across its three segments automotive, motorcycles and financial services. In the same year, the company delivered around 2.5 million cars - 140 thousand of which were electric - and 165 thousand motorcycles to its customers. These vehicles were produced at 30 locations in 14 different countries worldwide. On top of that, BMW constitutes the world's 20th most valuable brand according to Forbes (Forbes, 2019). (BMW01, 2019[6]; BMW02, 2019)

BMW presents itself as highly forward looking provider of individual premium mobility. This can be seen in their 'Strategy Number One > Next', a strategic direction introduced in 2017 that is aimed at leveraging "innovative technologies, digitalisation and sustainability to deliver unique customer experiences" (BMW03, 2019). The cornerstones of this strategy are the electrification of vehicles and autonomous driving.

Another focal part of BMW's strategic vision is the commercialization of carsharing business models. In recent years, BMW has been developing two subsidiaries harnessing carsharing business models. DriveNow is a carsharing company founded in 2011 that operates in 13 cities across nine European countries (BMW12, 2019). On the other hand, ReachNow, founded in 2016, was a BMW business unit offering carsharing services in the USA (BMW13, 2019). Both services are built on the app-based short-term rental of vehicles for private use. All vehicles are thereby owned by the respective carsharing companies. On top of that, BMW is continuously testing other services, e.g. peer-to-peer carsharing for owners of Mini vehicles in Spain (Interview, 2019). In 2018 BMW merged its carsharing business units with those of Daimler (most notably the carsharing subsidiary Car2Go) to form the joint-venture YourNow in 2018.

[6] In the following sections, all sources published by the BMW Group (e.g. Company websites and press releases) are abbreviated by a code ranging from BMW01 to BMW16. Please see the Bibliography of this thesis for a table connecting the codes with the respective publications.

5.2 Interview with Key Informant Marcus Krieg (BMW Group)

The following section discusses the insights obtained during the interview with Marcus Krieg, at the time the Head of Mobility Services at the BMW Group, as well as through the analysis of BMW's public appearance. In particular, a historical account of BMW's adoption of carsharing business models is presented in a narrative manner.

DriveNow was founded in 2011 as a joint venture between BMW and the car rental company Sixt, with both companies holding 50% of the shares. However, in 2017 BMW decided to buy Sixt's shares and transform DriveNow into a fully owned subsidiary of the BMW Group. DriveNow's service is built on the app-based short-term rental of BMW-owned vehicles for private use. It constitutes a free-floating carsharing service, meaning that vehicles can be picked up and dropped off anywhere within an indicated area of use (Interview, 2019).
Asked about BMW's motivation to adopt a carsharing business model, M. Krieg named the changing mobility demands of customers as the main driver. In particular, he stated that customers demand the ability to combine different forms of mobility services (e.g. carsharing, ride hailing and public transport), while having centralized solutions for booking, routing, and payment. In other words, customers demand the ability to tailor mobility services to their individual needs (BMW04, 2019). BMW expects private vehicle ownership to not sufficiently satisfy the new mobility demands of customers due to barriers such as congestion, limited parking in urban areas and traffic restrictions (BMW05, 2019). As a result, BMW anticipates shared, electric mobility to become the new dominant design of urban mobility (Interview, 2019). However, BMW is also expecting carsharing to remain a niche market without the incorporation of autonomously driving vehicles (Interview, 2019).

The widespread adoption of carsharing is likely to be accompanied by a decrease in the sales of privately owned vehicles, i.e BMW's major source of revenue. As such, the decision to adopt carsharing was made in order to ensure the long-term viability of the company by extending their operations from car manufacturing towards providing mobility services.

> *"I think it is quite important to be prepared for this development and to find the right balance of producing cars for end customers - which we will surely still see in the future as well - while also finding our business area when it comes to operating*

shared mobility. BMW has to make up their mind what role they want to play in that game." (Interview, 2019)

This quote emphasizes the uncertainties entailed in carsharing due to the novelty of both the business model and the underlying technologies. Asked how BMW tackled these uncertainties, M. Krieg pointed out three distinct ways. First, BMW decided to enter the emerging carsharing market relatively early. This can be seen in that the founding year of DriveNow (i.e. 2011) is approximately ten years prior to the projected year of widespread adoption (i.e. 2020) (Interview, 2019). As no dominant design had yet emerged and the competitive pressure in the market was still low, BMW used customer feedback and market research for the continuous improvement of the underlying software and thus the service.

"Of course we learned a lot during the first years of carsharing and from there it was a continuous improvement cycle. We are releasing new software to our carsharing modules - that is all our 10.000 cars in the field - every six weeks. We do this to make sure that we react to customer feedback by innovating and bringing new features to the cars. We also look to competitors and at the general market development." (Interview, 2019)

Second, M. Krieg pointed out how BMW was able to capitalize on second-mover advantages by analyzing Daimler's introduction of Car2Go three years prior (i.e. 2008). Not only was BMW able to avoid mistakes Daimler made priorly, but analysing Car2Go's entry to the market also helped reduce uncertainties (Interview, 2019).

"...it was beneficial to learn from the experiences and mistakes Car2Go made and develop our own approach based on that." (Interview, 2019)

Third, BMW's decision to found DriveNow as a joint venture together with Sixt also helped in reducing initial uncertainties due to Sixt's experience in operating car fleets.

"[Sixt] knew how to really optimize the costs and operations of car fleets [...]. BMW did not have this skill set, which is the reason we said that Sixt is a perfect partner for us. They brought in the experience while we brought in the cars and the needed telematic systems. In that sense it was a perfect match." (Interview, 2019)

Specifically, Sixt's software development teams and call-center structures were mentioned as major assets in the interview. Asked why the partnership had been terminated, M. Krieg replied that Sixt's limited size hindered the scaling goals of DriveNow and that BMW wanted to obtain full strategic control over the company (Interview, 2019).

Asked about the reasons for initially founding DriveNow as its own corporate entity rather than a business unit within BMW, M. Krieg pointed at internal debates regarding the viability and relevance of carsharing.

> *"There are still a lot of people thinking that our business will remain in the future as it is today and that we will definitely grow further in terms of selling cars. We are convinced that this will not be the case and that we have to find new business models and new ways to get people mobile." (Interview, 2019)*

Being an external company, DriveNow was able to ignore a lot of this internal debate and solely focus on developing the carsharing service (Interview, 2019). Additionally, it endowed DriveNow with high levels of organizational fluidity by being able to operate without regard for BMW's internal regulations and rigid organizational processes (Interview, 2019).

Asked how DriveNow specifically benefited from being an external company, M. Krieg pointed towards the development of ReachNow, BMW's carsharing service introduced to the North American market in 2016. Even though ReachNow employed the same technology championed by DriveNow and was able to utilize the insights obtained from introducing DriveNow to its European markets, the development of ReachNow was more complex, more expensive and took more time (Interview, 2019). According to M. Krieg, this was due to the fact that ReachNow was founded as a fully owned subsidiary of BMW and thus subject to BMW's regulations and rigid bureaucracy.

Questioned about the importance of the sustainability aspect of carsharing, it was stated that emphasizing sustainability is crucial for convincing both customers and governmental institutions of the advantages of carsharing.

> *"[We] want to show that there is a way of sustainable individual mobility. Sharing and electrification is the perfect combination to really be sustainable in an urban area." (Interview, 2019)*

Additionally, a large part of BMW's public press releases emphasize the importance of shared mobility services in reaching their long-term goal of emission-free mobility due to their potential to reduce the number of vehicles required while also replacing old ICE

vehicles with low-emission or electric vehicles (BMW06, 2019; BMW07, 2019; BMW14, 2019)

On top of that, BMW established several 'Competence Center of Urban Mobility' tasked with collaborating with city governments on trying to find solutions for more efficient and sustainable traffic. The main goal is to derive common visions of urban mobility for each individual city. (Interview, 2019)

Asked about what BMW considers to be the most important asset in carsharing, M. Krieg mentioned having a well performing app and stable IT systems as crucial for delivering a valuable service to customers (Interview, 2019). Subsequently asked whether this leads to a competitive advantage for tech companies, M. Krieg conversely argued that it leads to a competitive advantage for car manufacturers. This is due to the fact that car manufacturers have full access into the boardnet structures of the vehicle. Thus, they can fully integrate the service into the car in order to optimize the user experience in a way tech companies are not able to. On top of that, he stressed that carsharing is asset heavy compared to other digital platforms, as carsharing companies need to own and manage fleets. Car manufacturers have substantially more experience in that field than tech companies, thus leading to another competitive advantage for them.

The final section of the interview was concerned with YOUR NOW, the joint-venture announced by BMW and Daimler in March 2018. The companies merged their existing carsharing, ride hailing, parking, charging and multimodality offerings, creating the five jointly owned companies ReachNow, ChargeNow, ParkNow, FreeNow and ShareNow. At the time of the merger, these companies had around 6 million customers, 20,000 carsharing vehicles and established operations in 14 countries (BMW08, 2019; BMW09, 2019; BMW10, 2019; BMW11, 2019; BMW14, 2019). The strategic goal of the joint venture is described by the two companies as providing "a holistic ecosystem of intelligent, seamlessly connected mobility services, available at the tap of a finger" (BMW16; 2019).

According to M. Krieg, BMW's motivation for merging its mobility services with Daimler had several reasons. First, BMW realized that the competition in the mobility services market was increasing due to tech companies entering the market and attracting significant investment. As such, remaining competitive required huge investments into the improvement

of the services and joining forces endowed the companies with the financial power needed to do so (BMW15, 2019; Interview, 2019). Second, merging increased the versatility of the service portfolio offered, thus allowing the development of an ecosystem-based approach comprising of different mobility services. This holistic approach is able to satisfy the rising demand of customers for versatile and customizable mobility services. On the other hand, it also increased the barriers of entry into the mobility services market (BMW15, 2019; Interview, 2019). Additionally, by offering a holistic ecosystem, YOUR NOW is aiming to address a variety of urban mobility challenges such as traffic congestion and pollution (BMW15, 2019; BMW16, 2019). Finally, the third reason for the companies to merge their mobility services lies in the potential to act as a sales channel for electric vehicles. As stated by M. Krieg, around 30% of customers buying a BMW i3 (an electric vehicle) gained their first experience with the vehicle through carsharing (Interview, 2019). By merging the carsharing services BMW and Daimler can scale them, thus reaching more customers and potentially selling more electric vehicles.

5.3 Summary of the New Capabilities Developed

In summary, Mr. Krieg mentioned the following new capabilities BMW required for its adoption of carsharing business models (Interview, 2019). First, BMW needed to shift its focus from producing and delivering physical products towards delivering services. Second, the company needed to internalize significant skills in software development and teleoperations to ensure the functionality of their IT system, app, and in-car communication. Third, the adoption of carsharing also required the development of new capabilities within fleet management and logistics.

5.4 Data Analysis

The next section presents the data gathered from the 53 different documents described in section 4.2. It answers the first sub-question, which is fitting for the analysis as it a descriptive question:

> *What sensing, seizing, reconfiguring processes does a company need to implement for the Business Model Innovation?*

The focus of the data gathered is on the processes that BMW applied to innovate on its business model. As anticipated, the analysis will follow the structure of the criteria used for

content analysis in the codification process. This division was necessary in order to properly address the research question, as eco-innovation and disruptive innovation have not yet been linked. The dynamic capability theory has been suggested to be the common ground of eco-innovation and disruptive theory in the literature review, and as such it constitutes the theoretical foundation of the theoretical framework.

On the one hand, the framework of Mezger (2014) was chosen to analyze disruptive innovation because it draws upon Teece's (2007) framework and it explores the application of such a framework for business model innovation in light of digital disruption.

On the other hand, the framework of Inigo et al. (2017) was chosen to analyze eco-innovation as it draws on the same taxonomy, Teece (2007), but analyzes business model innovation through the integration of environmental and social aspects for value creation.

The data analyzed through the process of codification and content analysis is presented in the following two sections.

5.4.1 Mezger's (2014) Dynamic Capabilities Framework

In this section, the processes attributed to Mezger's (2014) dynamic capabilities framework will be analyzed following the taxonomy identified by Teece (2007), namely Sensing, Seizing and Reconfiguring. This section aims to narrate the process of adoption of business model innovation in light of digital and technological disruption. It is important to notice the sources and processes utilized to generate, gather and implement new knowledge. Specifically these processes build up to the adoption and further improvement of carsharing business models by the case company.

5.4.1.1 Sensing

The dynamic capability of sensing entails identifying BM opportunities and trends and gathering information on emerging technologies. The focus given by the author, derived from the analysis of digital disruption, is scanning the external environment and establishing links with the sources of new technology and BMI. The analysis of other firm's BM and the acquisition of knowledge through talent acquisition are emphasized.

BMW has pride in its innovation culture and as such recognizes the necessity to establish links and collaborations with external actors in order to develop its sensing capability with regard to innovative technology and emerging trends.

“"It would be dangerous to rely exclusively on our own innovative strength or that of our established suppliers,” Schambeck told TNW. “In order to maintain innovation leadership it is extremely important to integrate the outside-in perspective.”" (D10)

In order to stay on top of its competition and of trends, BMW has established many institutionalized processes, projects and collaborations to foster internal and external knowledge flows.

The process starts with the outside-in perspective, where BMW links to the most disruptive and innovative Startups. It does so in many different ways: through the Virtual Innovation Agency (VIA) they gather unsolicited requests for collaborations, project proposals and innovative ideas from those who are not in the BMW network (D03); through BMW Startup Garage they screen for startups to be incubated and receive funding in order to become part of the value chain of BMW (with BMW usually being their sole customer) (D09; D10; D45) through the BMW Innovation Lab they collaborare in close contact with startups in order to gather ideas, help them launch their product and ultimately collaborate with BMW (D02; D05; D12; D19).

In order to always tap into trends and sense upcoming technologies or business models, BMW taps into the crowd through co-creation activities and projects.

"For car giant BMW, open innovation offers plenty of opportunities to increase its product pipeline and to integrate external ideas into its ideation process" (D11)

BMW's Co-creation Lab, launched in 2010, is a place where car enthusiast can share their product ideas with BMW (D08; D11). At the same time, this and other venues have been used to hold contests such as the "Next Visionaries" Contest from BMW i, which aims at shaping the future of mobility (D39) and 'The BMW Urban Driving Experience' which aims at gathering ideas for new services to implement to improve the driving experience (D40).

Other co-creation activities were aimed at a technical community, for example the case of the collaboration with Local Motors, an open innovation community of car enthusiasts and specialists (D40).

Last but not least, BMW seeks and forsters idea creation within its established network by awarding prizes to the suppliers who manage to innovate in one of the categories of the BMW Supplier Innovation Award (SIA) (D03; D06). This is a way of incentivizing suppliers and partners to keep generating ideas and innovating with them, while at the same time establishing a process of continuous analysis of other companies BM and technologies.

The outside-in approach is only one face of BMW's sensing ability. In fact the ability to analyze and assess external ideas comes from within.
The Ideas Management System of BMW is the perfect example (D03). It allows any employee to contribute ideas regarding any aspect of the business, the product or processes, which led BMW to save € 17. 5 million in 2015 by implementing around 4900 ideas. BMW not only shows to be open to ideas but also to be willing to implement them at the end of the day, thus incentivizing people to submit more.

This innovation and idea sharing culture is clear in the BMW Group Research and Innovation Center (FIZ) (D03), a center incentivizing the exchange of innovative ideas among all involved in product development across all areas of expertise. Next to employees working in technical fields, this also includes non-technical employees working in other areas.
"By working with the start-ups, it opened our minds to how we can be more agile, how we can be faster to market and how we can think just that little bit differently." (D05; D19)
Through projects and collaborations BMW stimulates a culture of innovation and intrapreneurship, for example through projects at the Innovation Lab where employees are encouraged to participate together with startups in order to develop their ideas and receive internal and external coaching and exposure to Universities as part of the process. Another example is BMW's collaboration with TIL Ventures, a specialist at building a culture of corporate innovation, which runs workshops and helps the employees to develop and commercialize their ideas (D05; D19).
When internal technical capabilities are not enough, BMW hires talents from different industries in order to increase the sensing capability in that industry and acquire instant R&D capabilities and know how.

5.4.1.2 Seizing

Seizing refers to a firm's ability to systematically transform insights on technology and BM opportunities gathered into actual new BMs. It relies on three main capabilities: (1) the adoption of a holistic innovation process focused on several components of the BM, (2) the integration of customer expectations and market knowledge in addition to the data gathered through sensing and (3) the establishment of continuous, iterative feedback processes in the development of new BMs.

BMW transition from selling cars to providing mobility services started in 2007 with "Project i", a special unit to develop solutions for sustainable mobility and the challenges of urban mobility (D01; D04; D07).

"After identifying the key external trends and challenges, such as urbanization, smaller households and climate change, BMW started to create a ground-breaking and comprehensive concept for sustainable mobility in 2007: Project i." (D04)

This project with the goal of shaping the mobility of the future was summarized the following way:

""Think ahead" is the statement claimed by the BMW Group for their holistic approach of sustainable mobility" (D04)

As Corporate Knights has found, the BMW Group adopts a holistic approach, implementing sustainability throughout the value chain (D25). This approach aims at finding solutions through sustainability for the challenges and opportunities identified by their sensing capabilities.

The process of developing sustainable mobility solutions has not ended yet. In fact, carsharing represents only one part of the service that BMW aims to provide. BMW Group's ACES strategy (D20; D36) - autonomous, connected, electrified, services and shared - shows that there are many complementary pieces that will provide the final solution, with "autonomous" constituting the missing pieces:

"Connected and autonomous mobility is seen as a key driver of smart urban mobility" (D41)

On the one hand, by being on top of trends and well connected to the actors in the market, BMW is well aware of the experiments and outcomes of other companies efforts. It is the

case of DriveNow that observed car2go in order to understand its challenges and avoid repeating the same mistakes.

"DriveNow learned a lesson from car2go, which withdrew from London in 2014, citing coordination difficulties between London's 33 districts." (D30)

On the other hand, BMW is a master in understanding customer expectations and matching them. A prime example is the amount of feedback and customer information that the company gathers through its open innovation and co-creation processes. In fact, customers use these platforms and contests to share product ideas and opinions with BMW.

"BMW's adoption of open innovation provides the company with numerous benefits.. ..access to a wider and more diverse pool of ideas, observations and perspectives (a very cost-effective form of market research)" (D11)

The platform capability developed for the new services allows BMW to focus their approach on the customer. The data collected this way is used to gather information on the driving experience of the customer and analyze what can be improved and what is not used.

"The platform capability allows us to have a customer-centric rather than a vehicle-centric approach. The customer profile powers the car. "We can engage with the customer and learn." (D41)

BMW is the first car manufacturer to introduce a service for managing car data, BMW CarData, which allows BMW and the other companies who register on the platform to study customers and predict trends and expectations (D32).

Thanks to the customer-centric approach and the process of gathering data through the platform and BMW CarData, BMW is able to have a constant stream of feedback on the product usage.

"We track which functions people use and we can analyze every experience. Then, we decide whether we should keep a function, improve it, or take it out. If a function is not used, we take it out" (D41)

The approach on the product and service is a data driven trial and error, which allows the company to try out many ideas and let the customer choose the best one.

"We still believe in a multi-modal approach and time will tell what is the preferred interface. We don't believe in the all-or-nothing approach adopted by some of our competitors." (D41)

Moreover BMW analyzes the market and the trends to apply the continuous improvement approach also to its internal processes.
"In addition to reducing CO2 emissions, its strategy also focuses on continuous improvement in areas such as corporate environmental protection, supply chain sustainability, employee orientation and social commitment." (D25)

5.4.1.3 Reconfiguring

Reconfiguring refers to a firm's ability to systematically implement newly developed BMs by reconfiguring its existing value chain, identify the competences and resources needed and source these competences and resources. This is due to the fact that transitioning to a new BM changes the value creation process of the company, making it very likely for the existing value chain to become obsolete and for new capabilities and resources to be needed.

Since the launch of Project i, BMW has been working on defining and developing the capabilities needed for their vision for the future of mobility. Their transition from selling cars to providing a service through carsharing comes with a number of new capabilities that the company had to develop internally, acquire or gain access to through collaborations and partnerships. According to Mezger (2014), the difference between internalizing a capability or sourcing it through a collaboration or partnership lies in whether it represents a core asset, which should be internalized, and whether it has a high degree of uncertainty, which in turn should be outsourced.

On the one hand, BMW's ability to develop new capabilities and technologies comes mainly from BMW Group Research and Innovation Center (FIZ), where all of those involved in product development across all areas of expertise work. The other source of internal capabilities comes from the intrapreneurship program coordinated by BMW Innovation Lab, which lets employees develop know-how within their new venture projects.
On the other hand, there are many different established processes for internalizing and acquiring capabilities and know-how. The most basic is talent acquisition, which was widely used in order to acquire software-related capabilities.

"I brought along some colleagues that I had worked with and took over an agile software unit from Microsoft in Chicago. This meant we had an immediate R&D footprint and could show results quickly." (D41)

Another process comes through BMW i Ventures which aims at acquiring capabilities specifically in the sector of IT.

"The initiative aims to promote mobile apps and mobile technology as part of BMWs long term growth strategy within the new mobility products and services market." (D43)

Besides generating and internalizing new capabilities, BMW has established a tight net of collaborations to gain access to the capabilities that does not intend to internalize.

The BMW Supplier Innovation Award (SIA) is conceived as an incentive for suppliers to continuously work with the BMW group on developing innovations and sustain their clear competitive edge over competitors.

BMW Innovation Lab and BMW Startup Garage allow the company to gain access to startup's emerging tech and expert know how.

"The startup generates revenue and the cooperation is set up as a real supplier-customer relationship between the BMW Group and the startup" (D10)

The main collaborations through which BMW acquired new capabilities involve three main fields: emerging technologies, fleet management and software development.

The most important emerging technology, which according to industry experts will enhance carsharing to a new level, is autonomous driving, for which BMW partnered up with Daimler in a co-creation and learning project (D14; D29). For the potentially disruptive technology of fuel cell technology, BMW has partnered up with Toyota (D15; D17).

As a car manufacturer, one of the main lacking resources of BMW was fleet management. In order to fill this gap it teamed up with Sixt in 2007 and formed the joint venture DriveNow (D01; D04; D30; D32; D33; D34; D36; D43; D44; D47; D49). When expanding to new markets, BMW has made use of local partners to manage the fleets as in the case of Arriva, when expanding to the city of Copenhagen, which also allowed the interconnection with the local public transport network (D48; D51). The same is true for the partnership with EVCard in China (D30; D36; D50).

"Strong local partners make ramping up and running the business much smoother." (D47)

The last main resource that BMW had to cooperate to develop with speed and reliability, is the IT structure and software capability needed to run a platform and process the data of the customer. The collaboration with Sixt provided the IT infrastructure that is still in use for DriveNow services, while HiveMQ was an important partner in the management of messaging and data transfer (D38). While talent acquisition helped set up DriveNow as an agile company that can handle software development, the collaboration with Microsoft Azure platform provided all the basic tools to work with AI and to date the company is developing its own algorithm on this platform (D41).

5.4.2 Inigo et al (2017) Dynamic Capabilities framework

In this second section, the processes attributed to Inigo et al. (2017) dynamic capabilities framework will be analyzed following the three step division first identified in Teece's (2007) taxonomy, namely Sensing, Seizing and Reconfiguring. The framework will be applied without division between incremental and radical BMIS, as the implication of division will be discussed in section 6.2. This section aims to narrate the process of adoption of business model innovation while incorporating environmental and social aspects for value creation. It is important to notice the inclusion of all the relevant stakeholders (including society and the environment) to the sources and processes utilized to generate, gather and implement relevant knowledge. Specifically these processes build up to the adoption and further improvement of the carsharing business model by the case company.

5.4.2.1 Sensing

The capability of sensing for BMIs according to Inigo et al. (2017) consists in the gradual integration of stakeholders and triple bottom line, to develop an external dialogue, and link to institutes and experts to prompt dialogue. Besides analyzing new technologies and new BM, the focus is on the regulatory agencies and the identification of trends and regulations that go against the existing BM. Moreover, a business should identify and concentrate on system based sustainability challenges and collective solutions.

BMW started to publicly address sustainability challenges and analyze for solutions in 2007 with Project i, a special unit to explore ideas on mobility and its sustainability. The strategic plan included addressing challenges such as depletion of fossil fuels reserves, increasing regulations, environmental awareness and urban mobility.

"“Project i”. A special unit to develop new ideas on mobility, and its sustainability. Their goal? To reduce the environmental impact, and solve the mobility challenges of those who live in big cities." (D01)

The process of sensing started with speaking with experts of these fields and external discussions, resulting in BMW realizing that there were different ways to tackling the problems of mobility.

“All of a sudden the car itself was no longer the only solution” (D07)

BMW's efforts to understand possibilities and trends evolved in different directions, mainly focused on collaborations to develop an understanding of sustainability, starting a dialogue with regulators and cities to find joint solutions for urban mobility, and scanning for new technologies and BMs among its suppliers and its external network of startups and crowds.

In order to understand how to integrate sustainability in the business, BMW participated in different discussions such as the Sustainable Innovation Forum (D20), it became a lead partner of Drive Sustainability (D27) and have collaborated with many other major companies to publish a handbook on Product Social Impact Assessment (D28). This process allowed BMW to build a network of experts and enter the discussion on sustainability in the business.

"we are taking part in an exchange of ideas and information with other stakeholders as part of this global dialogue. The forum is the perfect venue for this." (D20)

The second step that BMW undertook, was the integration of stakeholders with regards to urban mobility. Urban mobility is a challenge that requires a collective solution, thus BMW created the Research Center for Urban Mobility, a unit comprised of experts from different fields (D20; Interview 2019).

"The joint task of the team is to engage with leaders of big cities and analyze their needs. This is at the prerequisite for developing new urban mobility solutions together with cities" (D20)

This ongoing process has led to the collaboration with many cities, such as the collaboration with Arriva, supported by the city of Copenhagen, which set in motion the integration of BMW's service with the public transportation system of the city.

Finally, BMW implemented the outside-in approach to establish numerous links to gather ideas on new technologies and BM that address mobility needs and sustainability challenges. The Virtual Innovation Agency (VIA) is an open channel for SMB whose innovation can solve complex problems and want to enter in contact with BMW. This approach allows unsolicited solutions to known problems. The BMW Supplier Innovation Award (SIA) allows BMW to analyze suppliers innovations on set categories, such as Sustainability, in order to be aware of new trends and incentivize such innovations. Other links to its network include collaboration with startups via BMW Startup Garage and BMW i Ventures which invest in startups that align with BMW sustainable innovation strategy.

"BMW i Ventures invests in cutting-edge solutions focusing on the mobility needs of the urban population." (D03)

The last link of BMW is with crowds through co-creation and open innovation contests. It is the case of the collaboration with the community of Local Motors or the contest *'Tomorrow's Urban Mobility Services'* (D08) and *'The BMW Urban Driving Experience'* which were launched within BMW's Co-Creation Lab.

5.4.2.2 Seizing

Seizing is the ability for a company to bring into action the knowledge gathered by sensing. According to Inigo et al. (2017) framework the processes to adopt in this step are: internal alignment in order to better leverage the new knowledge, implementation of sustainability oriented methodologies, inclusion of external stakeholders to leverage the information, partner up in a co-learning and co-creation process to fill knowledge gaps and create new knowledge, adopt a socio-technical system-based approach and act as an activist to guide consumers in the transition together with the company.

BMW's company innovation culture allows employees to feel empowered as it allows them to submit ideas through the Ideas Management system, but in order to have internal alignment there needs to be understanding and agreement with the strategy undertaken. We know from the interview with the head of on demand mobility at BMW (Interview, 2019) that it was hard to align every department since the new BM could cannibalize the existing one. In order to create alignment, strategy NUMBER ONE > NEXT and Project i were created, strategy number one setting corporate sustainability goals and Project i creating a separate unit were these ideas were freely explored. This strategy and sustainability requirements were passed to the suppliers as well, which have to meet the same environmental and social standards set for BMW.
"For the BMW Group, it is essential that their business partners meet the same environmental and social standards they have set themselves." (D03)

BMW is in fact driving the market as a pacesetter. From its future-proof product portfolio, the piloting of the Product Social Impact Assessments, the establishment of a supplier sustainability code, to being the lead partner of Driving Sustainability, it is leading the way toward a transition towards sustainable mobility. It is doing so with the establishment of standards and the introduction and continuous improvement of sustainability methods throughout the entire value chain.
"BMW considers sustainability as a continuous process that does not begin nor ends at a particular moment in time." (D04)

Its approach to sustainability can be defined as holistic and socio-technical as it addresses every aspect of sustainability and applies its solution in collaboration with stakeholders such as customers, cities and communities. The Urban Mobility Research Center is not only a place where it gathers trends and information but it also establishes a link of collaboration with regulators experts from all the fields and cities. Moreover, the knowledge gathered in the sensing step is applied to the entire value chain and even suppliers are expected to meet the same standards.

In order to fill knowledge gaps and co-create solutions to the identified challenges, BMW utilizes its network of startups and communities, as can be seen in the BMW Startup Garage,

the Co-creation lab, BMW connecting with emerging tech and the most advanced research of the startups, or BMW utilizing the ideas and creativity of the communities of enthusiasts who contribute in the contests (e.g. the 'BMW Urban Driving Experience Challenge') or coming from expert communities like Local Motors.

"BMW opened its doors to external entrepreneurs to partner with them to support our innovation plan. This way we develop new services that tackle the changing customer needs we are seeing and help us find new ways to capitalise on new technologies." (D02)

Finally, BMW utilizes its partnerships and collaborations to fill gaps and develop new knowledge together. Prime examples are the collaboration with Daimler and IBERDROLA.

Daimler teamed up with BMW as they both lack the knowledge necessary for a functional autonomous driving system and are going to develop this technology together as it is fundamental for the maturation of the carsharing BM.

"Why does this alliance make sense? The answer is simple: Because automated driving is a future-oriented technology that will radically transform our industry — and because in the long run we will be not only stronger but also more successful as partners than we would be alone" (D14)

In the case of IBERDROLA, the collaboration focuses on the creation of a comprehensive solution that meets the charging needs of electric vehicles in both the public and private sectors. This is an important step for the electric fleet within BMW's carsharing scheme (D53.

5.4.2.3 Reconfiguring

Reconfiguring is the ability to develop new competencies and renew the organization, which are required steps for the ongoing BMI. According to Inigo et al.'s (2017) framework, the processes that characterize this phase are: (1) managing sustainability goals at all levels of the organization, (2) sharing responsibility and creating a more horizontal implementation process, (3) creating innovation teams and generating spin-offs, and (4) implement sustainability in every step of the value chain.

BMW implemented a holistic approach to BMIs by managing sustainability at all levels of the organization and across the entire value chain.

"The BMW Group's commitment to the Sustainable Innovation Forum is a unique tradition, and for good reason. Sustainable management is part of our corporate strategy. We have a holistic approach to sustainability across our entire value chain" (D20)

The strategy NUMBER ONE > NEXT is meant to apply sustainability along the entire value chain of BMW. Moreover, the same standards are required from BMW's suppliers. Through BMW's Supplier Innovation Award (SIA), the company encourages suppliers to keep innovating in various categories, one of which being sustainability.

"Corporate knights found that the BMW Group adopts an holistic approach, implementing sustainability throughout the value chain. In addition to reducing CO2 emissions, its strategy also focuses on continuous improvement in areas such as corporate environmental protection, supply chain sustainability, employee orientation and social commitment." (D25)

In order to apply these goals in the entire company, BMW is empowering employees through intrapreneurial initiatives. This way the employees feel responsible and see that their ideas are eventually implemented.

"Combe cites harnessing the entrepreneurial spirit within teams, alongside the establishment of new practices and processes that enable ideas to flourish, and flourish at speed, as competition changers" (D02)

When undergoing many changes and exploring many different implementations of the knowledge gathered, the framework suggests that the company should create innovation teams and generate spin offs. In this way the teams and new ventures have more flexibility and speed, as Markus Krieg explained in the interview while comparing DriveNow, a new venture, and ReachNow, fully owned and operated by BMW (Interview, 2019).

The approach of innovation teams has been adopted for the creation of Project i, which was a special unit to develop new ideas on mobility, and its sustainability. This project didn't have to respond to the rules and the processes of BMW, instead had freedom of experimentation. The same approach was applied to BMW Group Research and Innovation Center (FIZ):

"The teams help employees to understand future requirements and to generate innovative products and services that users will love. Special facilities at the research and innovation site in Garching/DE have been set up for work on innovation projects." (D03)

These experimentations resulted in the generation of a series of spinoffs that each represent a different implementation of the knowledge gathered. BMW i Ventures was developed in order to be able to source new technologies and contribute to the future of urban mobility. Alphabet and Alphacity are two implementations that represent corporate carsharing and short term rental (D05; D18; D19; D24; D43; D53), while DriveNow represents the effort of providing a carsharing service to privates through a B2C free floating carsharing platform.
Finally, BMW i represents a new brand sprung from the idea of an EV car that aims at being 100% emission free and 95% recyclable.
"BMW i has a focus on sustainability throughout the entire value chain. From design to production, from its day-to-day use to its disposal: every link in the value chain is based on sustainability." (D04)

5.5 Summary of Analysis

As the analysis shows, the frameworks each represents one side of BMW's processes in its effort to transition into a new business model. While some points are similar and touch upon the same concepts - i.e. sensing in both frameworks empathizes the connection with emerging tech and trends - others are different due to the different focuses of the frameworks. While Mezger's (2014) framework focuses seizing on the integration of market knowledge and iterative feedback processes, Inigo et al.'s (2017) framework focuses on internal alignment, external stakeholders integration, and co-creation and co-learning processes. BMW does not follow one or the other but is a combination of both. The implications of such findings are discussed in the following section.

6 DISCUSSION

6.1 Carsharing as a Disruptive Innovation

This section is concerned with analyzing whether carsharing does, in fact, constitute a disruptive innovation. Naturally, this poses a critical prerequisite for discussing the dynamic capabilities employed by BMW in its adoption of carsharing from the perspective of disruptive innovation theory. The theoretical section of this thesis offers an in-depth discussion of the characteristics of disruptive innovation, the process of disruption, and the challenges for incumbents in identifying and responding to disruptive innovations. These will now be compared with the characteristics of carsharing, how carsharing has been introduced to global markets, and the challenges for BMW in adopting carsharing.

The definition of disruptive innovation was derived by analyzing the three intrinsic innovation characteristics functionality, technical standards, and ownership. As such, disruptive innovation is characterized by radical functionality, discontinuous technical standards, and new forms of ownership. Carsharing shares all three of these characteristics. First, whether an innovation is radical or incremental is determined by how it relates to priorly existing solutions (Schilling, 2017). Carsharing does not constitute an incremental development from private car ownership but rather a fundamentally different way of satisfying mobility needs. As such, its functionality can be described as radical. Second, carsharing's underlying technology, i.e. its software, does not represent an evolution from traditional automotive technologies. Instead, it constitutes a novel technology lying on an entirely novel technology S-curve. Thus, this technology discontinues the technological standard. Third, carsharing implies a new form of ownership, as customers are no longer required to buy, and thus own, vehicles but rather pay usage fees with the vehicles being owned by the carsharing provider. In summary, carsharing possesses the intrinsic characteristics of a disruptive innovation.

Next, it is compared whether the development of carsharing matches the process of market disruption described in the theory. Generally, disruption is described as the introduction of a disruptive innovation by new entrants with the aim of satisfying the demands of less profitable customer segments that are overlooked or ignored by incumbents. It is usually introduced at the low- or high-end of the market or used to create a new market. Thereby, the

disruptive innovation is enabled by technological advances and requires a new business model for commercialization. While it does not exceed the established products in all performance dimensions, it does overcome the market's expectations in some. Finally, it is incrementally improved until it is attractive to mainstream customer segments, with their eventual adoption representing the end of the disruption process, i.e. the market being disrupted.[7]

The development of carsharing does match most of these characteristics. First, it was initially introduced by startup firms such as Zipcar rather than the incumbents of the automotive industry. Second, it was aimed at customers demanding an alternative to private car ownership, a customer segment ignored by car manufacturers. As these customers previously did not require a privately owned car or were not able to afford one, the main aim was to create a new market. Third, carsharing is enabled by technological advances in software development and the telematic systems within vehicles as well as the adoption of smartphones. Fourth, as argued before, carsharing is based on an entirely different business model than traditional car manufacturing. Fifth, carsharing is inferior than owning a vehicle in certain performance dimensions as customers do not have the vehicle at their disposal at all times. However, it exceeds in other performance dimensions such as price, with using carsharing services being significantly less expensive than private car ownership, and parking, with the possibility to leave the vehicle behind in a designated area. Finally, it is not yet possible to assess whether carsharing will fully disrupt the market. This is due to the fact that a widespread adoption of carsharing by mainstream customers as an alternative to private car ownership has not yet happened. However, the data demonstrates that incumbents in the automotive industry anticipate this mainstream adoption to happen within the next few years, at least in urban areas. In summary, the development of carsharing so far matches the characteristics of market disruption. Whether it will actually disrupt the automotive industry can not yet be assessed.

Lastly, three major challenges for incumbents in identifying and responding to disruption have been identified within theory. First, incumbents often fail to anticipate the development of disruption. Looking at the dates of introduction of different carsharing services, one can

[7] Cf. section *'2.1.1 The Process of Disruption'* vor an in-depth description of how innovation can disrupt a market.

observe that companies like Zipcar - which introduced their carsharing service in 2000 - beat the incumbents by several years, with Daimler introducing Car2Go in 2008 and BMW introducing DriveNow in 2011.

Second, disruptive innovations are often times financially unappealing to incumbents as they entail high financial risks and require internal reconfigurations. BMW decided to adopt carsharing via a joint-venture with an external partner - i.e. DriveNow - and was thus able to mitigate the financial risks involved and the hindering effects of rigid organizational structures (Interview, 2019). Thus, it is reasonable to assume that this challenge was - at least initially - present. On top of that, the fact that the internally developed ReachNow faced problems within its development due to internal impediments supports this claim.

The third challenge incumbents face according to theory is the so-called 'innovator's dilemma' (Christensen, 1997). This refers to incumbents being reluctant to adopt innovations that cannibalize their existing profitable offerings. This challenge was present in BMW's adoption of carsharing. In the interview, a detailed account of the internal turmoil following BMW's initial investments into carsharing was given, with employees' being concerned with carsharing having the potential to destroy the existing - and still profitable - core business. Thus, the 'innovator's dilemma' was, and still is, a present concern within the company.

In summary, the challenges faced by BMW in adopting carsharing match the challenges identified by theory for incumbents in responding to disruptive innovation.

In conclusion, the case of carsharing does represent the theory of disruptive innovation very well. First, the characteristics of carsharing fit the characteristics of disruptive innovation. Second, the adoption of carsharing matches the process of disruption, with the only caveat being that the large-scale adoption has not yet happened. However, it is expected to happen by the major players in the market within the next few years. Third, the challenges faced by BMW are congruent with the challenges identified by prior research on disruptive innovation. The fact that a large-scale adoption of carsharing has not yet happened prohibits its classification as a disruptive innovation. However, carsharing does share the characteristics of disruptive innovation and is on the path to disrupt the automotive industry. As such, the discussion of carsharing from a disruptive innovation perspective is possible.

6.2 Carsharing as an Eco-Innovation

This section, in turn, is concerned with analyzing whether carsharing constitutes an eco-innovation Building on the theory section of this thesis, carsharing will first be compared with the general definition and characteristics of eco-innovation discussed in section 2. Next, carsharing will be classified according to the taxonomy of eco-innovations presented in the theory. Finally, the type of business model innovation that carsharing implies, for incumbents in the automotive industry, will be derived.

Eco-innovation can generally be defined as any innovation that reduces the environmental impacts of production and consumption activities while sustaining economic returns. Carsharing does not perfectly fit this definition, its impact was thought to be beneficial for the environment a priori, but as it democratizes access to cars for people who cannot afford it, it creates an incentive to use the carsharing scheme instead of public transportation or for example biking. To date the introduction of additional cars and the possibility for more people to use cars does not constitute in itself an a benefit for the environment. A dynamic view of carsharing going from a niche to a mainstream adoption shows the positive effect on the environment that characterize this BM as eco-sustainable (Firnkorn and Shaheen, 2015).
This BM is part of a greater scheme that includes autonomous, connected, electrified, service and shared, the realization of each of these pieces will result in the dynamic view proposed by Firnkorn and Shaheen (2015). On top of that, the scheme of carsharing features a great amount of EV in its fleet, i.e. the fleet of DriveNow as reported in the documents (D30). As such, large-scale adoption of carsharing would result in the environmental impact of production activities being lowered due to the lower number of vehicles required and the environmental impact of consumption activities being lowered due to the higher share of electric vehicles in use. Consequently, carsharing does fit this general definition of eco-innovation.

On top of that, researchers have argued that an innovation has to possess four distinct characteristics in order to be classified as an eco-innovation. First, eco-innovations involve some technological change compared to existing solutions. Second, eco-innovations are a response to the sustainability demands of users. Third, eco-innovations entail a change to the

offering company's value proposition. Finally, eco-innovations require the involvement of a variety of external stakeholders. (Kiefer et al., 2017)

Carsharing does possess all four of these required characteristics to some extent. First, the necessary software and telematic systems constitute a technological change as they were not required in the vehicles traditionally sold for private usage. Second, as supported by the documents, the adoption of carsharing by incumbents is a response to the changing demands of customers is shifting toward carsharing rather than ownership. It was also argued in the interviews that carsharing constitutes a response to the increasing sustainability demands of policy makers, e.g. municipal governments. In summary, carsharing is a response to sustainability demands and potentially to the sustainability demands of its users. Thus, it does possess this second characteristic. Third, carsharing implies a fundamentally different value proposition than the manufacturing and commercialization of vehicles for private ownership. This is due to the fact that the value proposition changes from a tangible product - i.e. the vehicle - to an intangible service. Whereas the product is based on the proposition of fully flexible mobility as well as having a monetary value, the service is based on accessible and flexible mobility at a low price point. Finally, the interviews present evidence that the development of carsharing does entail the involvement of two distinct groups of external stakeholders. On the one hand, the documents analyzed argued that the novelty and uncertainty demanded the involvement of customers into the development process as well as customer feedback in the implementation process. On the other hand, it was necessary to involve the municipal governments (cities) in the development of an urban mobility solution and the establishment of the infrastructure required for carsharing in the city system, thus cooperation with this group of stakeholders (e.g. through initiatives such as BMW's Competence Center of Urban Mobility) was crucial.

In summary, carsharing is not completely environmentally sustainable as an innovation due to its early stage of development. However it fits the definition and possesses the characteristics of eco-innovation. Thus, an analysis of the dynamic capabilities required for the business model innovation implied by carsharing from the theoretical perspective of eco-innovation is feasible. In a next step, carsharing will be classified according to the taxonomy of eco-innovation discussed in the theory section of this thesis, as this may have implications for this subsequent analysis.

Theory offers a distinction between radical and incremental eco-innovations. Similar to the aforementioned discussion of radical functionality as a prerequisite for disruptive innovation, this distinction is again based on how the eco-innovation relates to existing solutions. Again, as carsharing constitutes a fundamentally different way to satisfy the mobility needs of customers it can be classified as a radical eco-innovations. This has implications for the organizational strategy employed by the companies adopting carsharing. Theory (e.g. He et al., 2018 & Salim et al., 2019) posits that companies adopting radical eco-innovations generally follow a proactive innovation strategy, with the adoption being motivated mainly by internal drivers. In the documents analyzed support the notion that the main goal in BMW's adoption of carsharing is to shape future mobility markets. On top of that, the recent decision to form the joint-venture with Daimler, Your Now, was done with the goal of developing an ecosystem of urban mobility services. This shows that the company is following a proactive strategy, which is in line with carsharing being a radical eco-innovation. It should also imply that the drivers for this adoption are mainly internal, such as a corporate culture with a strong focus on technological innovation and managerial concerns for the long-term transformation of urban mobility. However, the analysis showed that external drivers such as customer demand, analysis of competitors and collaboration with other companies and communities played a big role in the development of carsharing. Thus, the definition of radical eco-innovation, which entails mainly internal drivers, is fitting but does not encompass the entire complexity of BMW's adoption of carsharing. For this reason the framework of Inigo et al. (2017) will be applied by matching the processes of BMW to both radical and incremental steps, according to the most fitting case.

In conclusion, the case of BMW's carsharing constitutes a potentially disruptive eco-innovation, with potentially meaning that despite the solid basis, only its full development and time will tell whether the innovation will disrupt the market and will be environmentally sustainable. However, for the scope of the research this definition suffices as a basis for the investigation of the processes implemented by BMW to transition to the BM of carsharing.

6.3 BMW's Processes

This section recounts the new capabilities developed by BMW in terms of skills and abilities needed for the new BM. It will then recount the projects, collaborations and ventures that BMW created in order to innovate upon its business model. These will be linked with the processes analyzed in section 5.4. Further synergies and influences of these processes will be assessed and compared to the frameworks.

6.3.1 New Capabilities Developed

In section 5.2 we looked at BMW's internal point of view regarding the processes and strategies that led them to innovate on their business model. The insights are mostly about the future vision and expectations for the development of these initiatives, especially regarding the recent partnerships with Daimler. It was interesting to see which skills and capabilities were the most important to develop for this new business model for BMW and how they compare to the capabilities of a tech company.

Mr. Krieg mentioned the following new capabilities BMW required for its adoption of carsharing business models (Interview, 2019). First, BMW needed to shift its mentality from producing and delivering physical products towards providing services to its customers. Second, the company needed to develop a new IT system, comprising telecommunication, a platform for the carsharing and acquire significant skills in software development to ensure the functionality of their app and in-car communication. These skills had to be connected with the boardnet structure knowledge that allowed BMW to integrate new functionalities directly in the car. Third, the adoption of carsharing also required the development of new capabilities within fleet management and logistics.

When compared to a software company, there are some similarities, namely the programming capabilities to develop and manage the app, the platform and the in-car communications. The difference is in the asset heavy type of company and in the capabilities to manage a fleet its logistics.

When asked about the core capabilities Mr. Krieg highlighted the importance of a well functioning app, as a service mentality entails customer centricity and attention to the customer experience. Second, he named the availability of the fleet, which represents a deciding factor in the customer experience.

6.3.2 The Implementation of Processes

While section 5 answers to the first sub-question, this section will answer the second sub-question:

How are these processes implemented?

The term "these" refers to the processes that were described in section 5. On the other hand, this section aims at investigating how BMW actually implemented the processes into projects, ventures and collaborations and explain the implications of the synergies and effects of such implementations.

The unified recounts of processes implemented in projects, ventures and collaborations differs from the analysis in the way that the analysis tells two different stories according to which framework the data is matched to, while the implemented processes explain the synergies and logical steps of a company that is still developing his new BM. On the one hand, the processes on their own do not fully address the company needs. Yet, when they are incorporated in a project that addresses multiple capabilities, the externalities created by these projects can be described. On the other hand, the response to eco-innovation and disruptive innovation are not separate, but stem from the same innovation culture and ability to understand and elaborate new knowledge which define BMW. Thus, they need to be looked at together. These, ventures and collaborations are presented in chronological order in order for the presentation to provide a logical succession of events.

6.3.2.1 Projects

BMW's innovation culture has been is nothing new. In fact, its Ideas Management System has been in place for more than 70 years. This system allowed BMW to establish two processes, mainly gathering ideas from its employees, from any department and regarding every aspect of the business, screening and understanding the ideas and feedback and actually implementing the ideas at a corporate level. It is very important for employees that the ideas are actually implemented as it gives them the ability to have an impact and be heard. This system also requires a standardized process of screening and approving the development ideas. This ability is referred to as absorptive capacity, or the ability of firm ability to recognize the value of new information, assimilate it, and apply it to commercial ends (e.g. Khanagha et al., 2018). This presence of this ability of BMW can be proved by the successful

implementation of around 4900 ideas resulting in estimated savings for € 17. 5 million in 2015. (D03)

Moreover, BMW does not only possess the capacity to recognize internal ideas but also technical knowledge, such as new technologies. It's the same ability, i.e. absorptive capacity, but applied to technical information. The reason why BMW has this ability is mainly thanks to the BMW Group Research and Innovation Center in Garching/DE (FIZ) funded in 1986. This site represents the focal point of BMW technical innovation, where experts from every department of product development work. The center is built in a way to foster ideas exchange and interaction among experts from different backgrounds.

2001

As a leader of innovation in its industry, BMW knows not to rely only on its knowledge but to be open to anybody who wants to contribute. In 2001 the company established a standardized process for external companies to contact BMW regarding new ideas for collaborations or similar projects, the Virtual Innovation Agency (VIA). It is a channel for companies who aren't yet part of BMW network, yet employing the same standardized screening and acceptance process to select and develop ideas. The VIA allows BMW to constantly analyze companies and project proposal and thus to stay up to date on trends and emerging technologies.

These three systems, i.e. the Ideas Management System, the FIZ and the VIA, are the foundations of BMW's ability to make sense of internal or external knowledge.

2007

Being able to sense emerging trends, BMW opened Project i in 2007 in order to explore the trends of urban mobility and sustainability. This project has the aim to define a vision, a strategy and the capabilities needed to meet the expected turn of events. By adopting the approach of an independent team, the people working in the project were not bound to BMW mentality, routines and bureaucracy and could thus explore with freedom and agility. This strategy of exploring through innovation teams is the first example of ambidexterity encountered for BMW with regard to new mobility solutions. Ambidexterity refers to the company's ability to balance exploration and exploitation, thus being creative and adaptable

while continuing to rely on the safe and proven method of business. BMW is in fact able to explore new strategies and ways of doing business while keeping its normal business running, which can be seen in the projects described below.

Strategy NUMBER ONE was launched in 2007 together with Project i in order to give guidance and allow to explore corporate sustainability goals that would shape the future strategy of the company. This is the first project strictly based on environmental sustainability and its purpose is to sense knowledge about the topic and strategize from it in order to create a base for sustainable practices. By aiming at changing the corporate goals, BMW embraces sustainability holistically from the start, just as it did with Project i for urban mobility challenges. The project introduced the process of stakeholder dialogue and lays the foundations for what will become the Center for Urban Mobility in 2015.

While researching and implementing sustainability and innovative solutions internally is important, BMW took a step further. The same year, it became a lead partner of Drive Sustainability, an automotive partnership that aimed at driving sustainability in the supply chain of the automotive industry. In this partnership competitors in the automotive industry got together in order to shape the suppliers side of the industry.

2010

On the basis of this effort, BMW also established a process of screening and rewarding suppliers that follow its innovation lead. The Supplier Innovation Award (SIA) was founded in 2010 and awards a prize for different categories, one of which being sustainability, to suppliers that show exceptional innovations. This is not only a clever way to incentivize innovation on the supplier side that allows BMW to stay on top of competition. It also allows BMW to continually expose itself to new knowledge, trends and innovation from different industries and to develop the ability to discern which innovation is better. In this way BMW established itself as a trendsetter both in technology and sustainability.

The links presented until now mainly refer to the exchange of knowledge with companies, partners and employees. The BMW's Co-Creation Lab funded in 2010 signals the beginning of a new method of gathering knowledge. It is a virtual lab that hosts contests targeted at

consumers, car enthusiasts and experts that willingly participate by sharing their ideas, feedback and preferences. The first contest was 'Tomorrow's Urban Mobility Services' in 2010. This is the first example of open innovation found in the documents, it is very important to understand that this provides BMW with a new stream of knowledge. Open innovation opens up a channel to receive customer feedback, include customer as a stakeholder and gather market research information. At the same time the company can test the ground by introducing new concepts and visions to the customer and getting instant feedback. In this case it introduced the concept of new types of mobility not only to gather ideas but also to test customers' reactions and willingness to use such a service. Moreover, open innovation allows for the inflow of cross-industry knowledge, which can lead to major innovative solutions (Cozzolino et al., 2018; Karimi & Walter, 2015). The establishment of an open innovation contest requires a structured process to gather, screen and assess ideas and feedback and implies the implementation of the winning solution, otherwise the process would lose value and the company would lose trust from the participants.

It can be concluded that BMW managed to do all this, as the contest has been declared a success and the participants were satisfied (D08). Additionally, another contest was held in 2012 and the overall range of open innovation projects was expanded, including a collaboration with the community of Local Motors, composed of car enthusiasts, engineers, mechanics and other automotive experts.

2013

In 2013, the concept of co-creation and co-learning was brought to a new level, with BMW joining the Sustainable Innovation Forum in order to engage in a global dialogue on sustainability challenges. This strategic move enables BMW to establish links with different stakeholders, exchange information and be aware of upcoming trends and challenges. This was also one of the first steps of inclusion of external stakeholders.

2014

Building on its knowledge on sustainability in the supply chain and its participation in global dialogue, BMW participated in the creation of the Product Social Impact Assessment handbook in 2014, together with other multinationals. By leading the research and development of these processes, BMW ensures to be in the forefront of sustainable practices.

2015

In 2015, BMW developed a structured approach for finding common solutions for urban mobility by including cities in the process. It started with founding the Urban Mobility Center, whose aim is to engage with leaders of big cities and analyze their needs to find collective solutions. Each team working in the center is composed of experts from different backgrounds and is constantly studying regulations and cities needs in order to forecast potential problems and find solutions. The process of stakeholder inclusion is an essential step when dealing with BMIS because eco-innovation includes a wider socio-technical context. Including external stakeholders like regulations, cities and the environment allows solutions to encompass the entirety of the needs. The processes of engaging in a continuous communication with external stakeholders, strategizing and implementing the solutions lets BMW have the support of cities and regulations and a constant stream of feedback.

When expanding its DriveNow business to Copenhagen, BMW utilized its link established through stakeholder dialogue and partnered up with the local company Arriva. Arriva is a public transport company with experience in fleet management. It is supported by The Danish Energy Agency and The Capital Region of Denmark. By connecting with Arriva, a potential competitors in terms of mobility services, DriveNow got the support of the important local stakeholders, filled the gap of fleet management skills and was able to integrate its fleet with the public transportation system of the city of Copenhagen.
The same approach was used in 2017 when expanding to China and Finland, where BMW's carsharing teamed up with local companies instead of fighting them as competitors.

2017

The business model of carsharing is not mature yet and also does not represent the final solution for BMW, which can be seen in the “BMW Group's ACES strategy - autonomous, connected, electrified, services and shared” launched in 2017. BMW adopted the role of mobility provider, in which carsharing represents only one part of the bigger solution. This means that the process of gathering knowledge, constant feedback and reconfiguration is not over yet. The holistic approach of BMW to innovate on urban mobility and transition into a

service provider shows commitment and as a trendsetter, it shows the ability to lead the industry.

2018

Finally, BMW recently introduced the BMW Innovation Lab in 2018. This program allows startups that have been selected to participate in a mentorship program, test their product at scale and receive funding from L Marks, a startup accelerator and venture fund company. Moreover, employees are encouraged to participate as well, in an intrapreneurial effort.
The program allows BMW to enter in contact with emerging tech startups, screen and assess their business model and their technology, work with them and finally sponsor them. This process allows BMW to expose itself to gather a wide range of knowledge and awareness of emerging trends while also finding potential partners. Moreover, the intrapreneurship program allows BMW's employees to develop specialized skills and work in a free environment. This resembles the innovation teams fostering idea creation and innovation culture as a trademark of BMW.

6.3.2.2 Ventures

The first venture that BMW created in terms of new mobility and sustainability was back in 1997, Alphacity. At the time Alphacity was a fleet management subsidiary of the BMW Group. Upon its success and expansion, BMW launched Alphabet as a corporate carsharing service in 2010. It served BMW by allowing it to test and develop fleet management abilities and experiment with carsharing. Additionally, BMW also introduced BMW on Demand, a car rental service, in 2010 as an experimentation of the freshly acquired knowledge through Project i.

2011

In 2011, BMW founded DriveNow, a company offering free floating carsharing services, in collaboration with Sixt. It is important to understand the learning process that BMW underwent, learning from its previous ventures and from car2go, the carsharing service of the competitor Daimler launched in 2008 and providing BMW with an example to study upon. The partnership with Sixt was described as a means to share risks and complete ability gaps: fleet management and IT systems (still in use by DriveNow).

2011 was also the year BMW launched BMW i Ventures. This venture capital fund was developed in order to be able to source new technologies and contribute to the future of urban mobility. This opened up a new channel for getting in contact with startups and sourcing new capabilities. At the same time the process of screening and assessing startups technology and business models allows BMW to use its absorptive capacity to retain and utilize some of that knowledge.

2012

On the same wave of Project i and BMW i Ventures, the company launched another venture: the BMW i Brand in 2012. It represents BMW's first effort to adopt sustainability on a technological level. BMW i Brand represents a new set of EVs that are based on sustainable propulsion and circular economy, being 95% recyclable. Electrification and circular economy are part of the strategy of BMW ACES and its commitment to sustainability.

2015

After BMW i Ventures' success, top executives at the company came up with a new venture idea that was run as a intrapreneurial project. BMW's Startup Garage was founded in 2015 and it is based on a new business model called venture-client. In this relationship the company assumes the role of an incubator, that mentors and helps startups through the advisory board while also being the first client of the startup. This venture allows BMW to seek and mentor new startups with innovative solutions and emerging tech and integrate in the supplier chain. It is similar to BMW i Ventures but it does not take shares of the company, thus having a strong focus on collaboration and freedom. Compared with BMW i Ventures, this process allows much more freedom to the startup while still aligning the startup's and BMW's interests by becoming its one and only client.

2016

Finally, BMW launched ReachNow, a carsharing service operated by BMW using RideCell platform, in 2016. This new venture was not operated independently as an agile innovation project. Instead, it had to stick to BMW's organizational processes. As discussed by Mr.

Krieg in the interview (Interview, 2019), this service was not as successful as DriveNow and one major cause was the lack of agility and independence.

6.4 Difference with the Analysis

This section aims at discussing the findings of the analysis and compare them with the implementation of the processes described in the previous section. Theories that are deemed relevant to explain the discussion will be taken into consideration. Moreover, the aim of this section is to answer the main research question by providing an improvement to the theory that is being tested.

The processes described in the analysis fit the frameworks to which they have been matched. However, the problem is that they do so only singularly and some synergies and practices are not covered by the frameworks. The discussion will thus try to unify the two theories and add additional processes that were essential for the case analyzed.

In order to explain the synergies of the implementation of the processes, five concepts from the theory and the case need to be taken into consideration: Absorptive capacity, Ambidexterity, Open Innovation, Startup approach, Environmental Sustainability.

Absorptive capacity is the ability to understand and utilize external knowledge. It is built by developing processes of R&D and technical know how and refers to the exploitation of knowledge. The focus is on having an open mentality but also the technical capabilities to commercially develop gathered knowledge. (Khanagha et al., 2018)

Ambidexterity refers to the ability of a company to balance the exploration of new knowledge and the exploitation of current knowledge. In practical terms, it refers to a company continuing to pursue its business while exploring new types of businesses in independent units such as innovation teams or spin offs. The focus is on giving some teams the freedom to exploration in the hope that it will bring value in the future, while the usual business produces value for the present. (Christensen et al., 2018; Ho & Chen, 2018; O'Reilly & Tushman, 2008)

Open innovation is the approach to propose a challenge to the public and accept solutions from whomever wants to submit his solution, regardless of whether they are customers, experts, enthusiasts or even another company. The focus here is to allow different sources of knowledge to naturally converge into the solution rather than seeking the perfect source for

the problem. It allows the engagement of communities and provides companies with knowledge about market research, feedback and expectations. (Cozzolino et al., 2018; Karimi & Walter, 2015)

"Startup approach" refers to the ability of a company to act as a startup and be agile, lean and open to new ideas and processes. Usually companies collaborate with startups in order to access this kind of mentality as it is very apt to foster innovation. This description has been derived from the documents regarding BMW.

Environmental Sustainability for a company means paying attention to the impact of the products that it produces, thus supply chain and waste management, but also addressing problems to the socio-technical level. This means integrating external and internal stakeholders in the processes in order to satisfy the social needs and develop technologies that solve the challenges by empowering the collective.

These five characteristics have been identified in the processes of BMW and play an explain the synergies created by the implementations of the processes through projects, ventures and collaborations.

The processes will now be analyzed together with their synergies and externalities with an eco-disruptive perspective in mind, thus comparing and combining the two frameworks. They will be divided in terms of network appartenance. This division builds upon the concept of acting holistically and integrating all the stakeholders, internal as well as external, derived from sustainability. Seven stakeholders have been identified: company, employees, suppliers, customers, public stakeholders, startups and industry.

The ability of sensing will be mainly connected to establishing links to internal or external knowledge sources and building the means to interpret the knowledge. The ability of seizing will be to make sense of the knowledge gathered and act upon it, while establishing feedback links to test the knowledge gathered. Finally reconfiguration will be based on filling the knowledge gaps, restructuring the value chain and implementing sustainability.

These processes will be explained for each stakeholder

6.4.1 Companies

The first internal stakeholder is the company itself. Regarding the sensing DC for companies, Mezger's (2014) framework mainly focuses on the external links that can be created and

refers to internal knowledge sensing only through talent acquisition. At the same time Inigo et al.'s (2017) framework focuses on implementation of triple bottom line. BMW addresses sensing as a company by fostering a culture of innovation, acquiring talent to develop instant R&D capabilities and implementing sustainability factors in the company. It is important to notice how the innovation culture and talent acquisition foster absorptive capacity through the openness to innovative ideas and the technical capabilities to implement the ideas. BMW also has a solid R&D structure, the Research and Innovation Center (FIZ), that provides strong technical know how for the implementation of ideas.

The seizing step is addressed by both frameworks by adopting a holistic approach to the BMI, as it will affect the whole company and not only the department or innovation team. Inigo et al. (2017) add internal alignment, introduction of sustainability methodology and the ability of the company to be an activist and instruct consumers. BMW implemented sustainability methodologies in the company, addressed the new role of mobility provider holistically and through the formulation of strategies and the shaping of the internal culture. It failed to create internal alignment but solved the issue by creating alignment inside each innovation team or venture. This example shows how it is impossible to internally align a company while exercising ambidexterity. The part of the company working on the core business will not have the same mentality as the innovation team, thus alignment has to be achieved per department.

The last step for the company, reconfiguring, differs vastly between the two frameworks: while for Mezger (2014) the focus is on internalizing core assets, Inigo et al. (2017) focuses on managing sustainability goals at all levels, share responsibility and create spin offs or innovation teams. BMW's efforts consisted of internalizing the core assets, such as the development of DriveNow's platform, the creation of innovation teams and spin offs and thus sharing responsibility inside the new teams or ventures, such as Project i or DriveNow. It also implemented corporate sustainability, enabling the management of sustainability goals at all levels. The adoption of innovation teams and spinoffs, allows BMW to internalize core assets for the projects and apply a startup approach where it is easy to be lean and agile and restructure the processes when needed.

In summary the revised processes are: *creation of an innovation culture and R&D through talent acquisition to build absorptive capacity* and *introduction of sustainability goals* for

sensing. For seizing: *address BMI holistically, create alignment within the departments* and *implement sustainability methodologies.* Finally the reconfiguring processes are: *creation of spin offs and innovation teams, share responsibility in the new teams, internalize the core capabilities* and *implement corporate sustainability.*

6.4.2 Employees

Employees are an extension of the company and as such they have been chosen as the second stakeholder to act upon. The two frameworks don't mention the employees when exposing the sensing steps, except for Inigo et al. (2017) suggesting to develop an internal dialogue to foster knowledge gathering. BMW on the other hand, has a strong innovation culture and as such has the Ideas Management System in place to gather employees ideas and implement them. Moreover, it has an intrapreneurship program where employees receive coaching and bring their ideas to implementation. These processes are not only important to gather ideas but also to build absorptive capacity within the workforce. The involvement in the development of an idea can in fact bring technical knowledge to the employee, resulting in an asset for the company.

In the second step, seizing, the employees are cited only by Inigo et al.'s (2017) framework, where internal alignment to better leverage the knowledge is suggested. BMW's employees are aligned with the corporate strategy unless they are part of an innovation team, in which case they are strongly aligned to the strategy of the team. Moreover, through the Intrapreneurial program and the Ideas Management System, the employees are empowered to take action on their ideas and thus work on the knowledge generated in the previous step.

Finally in the third step, reconfiguration, the employees are mentioned only by Inigo et al.'s (2017) framework, where they take part in innovation teams and receive increased responsibility as a more horizontal implementation process and alignment has been achieved. In BMW's case the increased responsibility and alignment of employees is achieved when they take part in innovation teams, spin offs or implement their ideas at the end of the Intrapreneurial program. It is clear that allowing employees to pursue their ideas while still working inside the company empowers them and allows them to take on more responsibility.

In summary *innovation culture, gather employees ideas, create an intrapreneurial program* are the processes identified for Sensing, *alignment to the corporate strategy or the innovation*

team, empowering the employees. Finally the last step, Reconfiguring, features *increasing responsibility and decision power of employees, allow employees to implement their ideas.*

6.4.3 Suppliers

The last internal stakeholder to include in the transition to a new BM is the network of suppliers. Suppliers are not internal to the company, but they are part of the network that contributes to the value chain of the business. In the frameworks the suppliers are not directly mentioned except for in the reconfiguring step restructuring the value chain (Mezger 2014) and implementation of sustainability in the value chain (Inigo et al. 2017). BMW took a different approach, for the step of sensing it established the SIA (Supplier Innovation Award) in order to continuously screen for innovations among suppliers. This step is important because it establishes a standardized process of screening and evaluation that increases the absorptive capacity of BMW toward supply chain knowledge. It can be argued that the Startup Garage, which builds a relationship of venture-client, aims at establishing links with startups that represent potential suppliers, thus sensing for suppliers knowledge.

The second step of seizing, or taking action on the knowledge gathered, is mainly influenced by the same project, the SIA. BMW in fact, has the power to choose its suppliers and incentivized suppliers to keep innovating through the continuous screening and awards. Moreover, BMW's holistic approach to sustainability imposes its own standards to the entire supply chain, for which it developed a sustainability code in order to be aligned. Thus, the company uses its influence to push suppliers to constantly innovate and help BMW maintain its competitive position in the market.

The last step, reconfiguring, is the only one cited by the frameworks. The restructuring of the value chain due to new needs and new ways of doing business is essential. By implementing sustainability goals and standards, BMW has to be consistent and structure its supply chain accordingly. The supplier are forced to either develop the capabilities required by BMW and their standards or BMW will seek new suppliers thanks to the vast knowledge it acquired through screening suppliers' innovations and processes and new startups.

In summary the sensing processes to include suppliers are: *continuously screen and assess suppliers innovations* and *use existing link with startup to find potential suppliers.* For the seizing step *incentivize supplier innovation* and *apply sustainability standards to suppliers.*

For the reconfiguring step *develop new capabilities together with suppliers* and *reconfigure supply chain according to new needs.*

6.4.4 Customers

Customers are the first stakeholders that do not belong to BMW's internal network. In the frameworks they are mentioned three times: Inigo et al.'s (2017) framework mentions them in the sensing step where companies are suggested to engage in dialogue with external stakeholders that contribute ideas, and in seizing where the company is recommended to act as an activist and teach customers about its services and values. In the Mezger (2014) framework, the customer are mentioned only in the seizing step where companies are supposed to incorporate customer information and knowledge, as a form of market research, to the sensing knowledge gathered. In reality, BMW has taken a far bigger step to include customer through its initiatives of open innovation. Open innovation through the form of contests and crowdsourcing projects allows the company to gather ideas and expectations of customers and potential customers, thus creating a link for sensing trends and gathering knowledge, but it also allows the company to use the customers brainpower to solve challenges and come up with solutions. Even more so, these open innovation projects give the company big amounts of information on the participants that can be classified as market research. Finally, these projects allow the company to test features and ideas with the customers before deploying them, using a trial and error approach even before launching the product to the market.

In conclusion the sensing processes identifies to include customers are: *include customers ideas and expectation via open innovation initiatives.* The seizing processes identified are: *Incorporate market research knowledge*, *solve challenges with the help of customers* and *test features and ideas with customers.* No reconfiguring processes were identified in connection with customer inclusion.

6.4.5 Public Stakeholders

Public stakeholders represent all those stakeholders that are influenced by the business of the company but are not directly part of the market or industry. In the case of BMW, these stakeholders are mainly the cities' administration who are influenced by BMW effort to

provide urban mobility solutions. The focus of including these stakeholders is to establish links that allow the company to solve environmental challenges through collective solutions, as sustainability challenges in particular entail more than just the industry, the socio-technical system.

The incorporation of external stakeholders is not considered in Mezger's (2014) framework, but it is a fundamental step in Inigo et al.'s (2017) framework. In the latter, dialogues with external stakeholders are a main step for the sensing capability, serving the purpose to understand the sustainability challenges and the needs of the external stakeholders. In the seizing step, the researchers suggest that the company should engage in co-learning and co-creation with the external stakeholders. Moreover, the company can be an activist and lead the dialogue. The last step, reconfiguring, suggests the creation of innovation teams and spin offs even though the framework does not directly correlate this with the incorporation of external stakeholders.

BMW started approaching sustainability and urban mobility by researching for knowledge through the establishment of Project i. The task was developed with the creation of the Urban mobility center, where teams of specialists from different backgrounds constantly check regulations and are in contact with cities' administration, the main external stakeholder for BMW. The company also participates in the Sustainable Innovation Forum in order to understand sustainability challenges that pose a threat to the socio-technical system that they influence. Thus, the sensing processes for this case are identification of external stakeholders and initiation of dialogue.

The seizing steps that BMW applied, mainly focuses on the continuous feedback provided by the dialogue and regulatory research, plus the added value of the creation of collective solutions with the cities, like the integration of the carsharing fleet with public transport.

The last step, reconfiguring, is approached by the company through the implementation of the solutions. BMW recognizes the need to tighten the link with cities and thus partners up with local companies that are supported by the city and the local stakeholders (state organs, power companies and communities). For example, this is the case for the Arriva partnership, supported by The Danish Energy Agency and The Capital Region of Denmark, which allowed BMW to integrate its carsharing fleet to the public transport system of Copenhagen.

In summary the processes identified for Sensing to integrate other external stakeholders are: *Identification of external stakeholders, establishment of dialogue with stakeholders through specialized teams* and *participation in the global dialogue for sustainability challenges.* For the Seizing step: *Continuous feedback from stakeholder dialogue* and *creation of collective solutions.* Finally the reconfiguring step features: *implementation of collective solutions* and *partnership with local stakeholders.*

6.4.6 Startups

Startups represent the network of emerging technology and trends but also a fast paced environment where a small company develops deep specific knowledge of one specific process and tries to launch its product in the market starting from scratches.

Both frameworks acknowledge the necessity for companies that want to innovate on their established BM to enter in contact with emerging tech and trends in the sensing step. Entrepreneurial environments represent the perfect place where to enter in contact with such knowledge. Mezger's (2014) framework, while analyzing the seizing step, recognizes the need for companies trying to innovate to establish feedback loops and use a trial and error approach. It is clear that this processes come from Mezger's study of digital disruption, and as such they resonate strongly to what this paper defined as startup approach. Finally, Inigo et al.'s (2017) framework recognizes the need for companies to create spin offs and innovation teams in the reconfiguration step. At the same time, Mezger's (2014) framework suggests that companies should either internalize or outsource capabilities depending on how important they are for the value chain and the risks involved in developing such capabilities.

BMW is very active in the startup world. First of all, it has many projects and ventures that continuously screen and assess startups in order to provide funding, purchasing stock, becoming a client or incubating them. These are the Startup Garage, an incubator where BMW also becomes the main client of the startup, BMW i Ventures, a Venture Capital fund that pursues tech and solutions for sustainability and urban mobility, and the Innovation Lab, a site where startup participate in a program of mentorship and acceleration together with BMW. In the sensing step, BMW creates different standardized processes to understand, screen and assess the startup knowledge and BM. For the seizing step, it teaches and mentors them while bringing them closer to solve BMW's knowledge gap or need, but at the same time it learns the startup approach connected to agility and lean processes. In the final step,

reconfiguring, BMW partners up with startups, includes them in their supply chain or acquires them in order to internalize the capabilities that they developed. In these steps, the concept of absorptive capacity is really important. If a company was to acquire a startup and had a weak absorptive capacity, the R&D and technology gathered would be poorly implemented or not implemented at all. It is thus very important that BMW manages to make good use of this knowledge and has the ability to use it. At the same time, BMW showed that forcing a company routines and bureaucracy onto an innovation team or startup, destabilizes the environment that led to the innovation in the first place. Thus, a company faced with eco-disruption that wishes to innovate on its BM, needs the ability of organizational ambidexterity in order keep creating value while exploring its newly acquired assets.

In summary the processes identified to include startups in the BMI according to the capability of Sensing are: *creating different standardized processes to understand, screen and assess startup knowledge and BM.* For the Seizing the processes are: *teaching and mentoring startups, collaborate to solve the company knowledge gap or capability need* and *learning the startup approach connected to agility and lean processes.* The last capability, reconfiguring, features: *partnering up with startups, including startups in the supply chain* or *acquiring startups to internalize missing capabilities.*

6.4.7 Industry

The term "Industry" was chosen to represent all the other companies in the industry that are not part of the company's network. It is important to be aware of where the industry is going and what competitors are doing in order to learn from them and be able to compete.

For the sensing capability, both frameworks acknowledge the necessity to screen competitors for new tech and BM in the sensing step. While Mezger's (2014) framework suggests to incorporate the industry in the seizing step only by including market and competition knowledge in the knowledge gathered by sensing, Inigo et al.'s (2017) framework suggests that companies come together in co-learning and co-creation efforts in order to develop new capabilities together. In the last step, the inclusion of other companies is recognized only by Mezger (2014), with the creation of partnership to acquire new capabilities.

BMW is always analyzing competitors and their projects. When launching DriveNow it used car2go as a reference in order to avoid repeating the same mistakes. At the same time it has a

system called VIA (Virtual Innovation Agency) where companies who are not yet in contact with BMW can propose ideas and projects. BMW screens and assesses these collaborations and gathers knowledge in the meantime. These processes are the core of BMW sensing the industry.

For the step of seizing, BMW engaged in co-learning and co-creation with different companies in the automotive industry. One example is the automotive partnership Drive Sustainability, where BMW is a lead partner. Other examples are the partnerships with Daimler or Toyota. These partnerships are aimed at pooling resources and develop new capabilities, such as autonomous driving and fuel cell technology. The last step, reconfiguring, features those partnerships where BMW needed to source missing capabilities, as it is the case for the partnership with Sixt in order to gain fleet management capabilities and IT system infrastructures.

In summary the processes identified to include the industry for the capability of Sensing are: *competitor analysis* and *establish an open channel where companies can easily suggest collaborations.* The Seizing capability features: *co-learning and co-creation to pool resources and develop new capabilities.* Finally, the Reconfiguring step identifies: *partnership to source missing capabilities.*

6.5 New Framework

The considerations reported in the discussion have been transposed into a framework for better identification of the processes and the actors involved.

The aim of adapting the two theories according to the case at hand is to answer the question:

How is a company able to innovate its BM when faced with eco-disruptive innovation?

The answer to the question is that a company that wishes to transition to a new BM when faced with eco-disruptive innovation has to integrate the seven stakeholders identified in the process and implement sustainability in its new BM through a series of processes that will guide it in the transition. These processes are identified with the taxonomy of Teece (2007) and are exposed in the framework below (Figure 4).

The framework created aims at facilitating BMI by incorporating sustainability and developing a disruptive innovation within the business model. Compared to the two frameworks of Inigo et al. (2017) and Mezger (2014), the framework describes the processes

in much more detail because it breaks down the best practices identified in the case of BMW, a leader in innovation.

		SENSING	SEIZING	RECONFIGURING
INTERNAL	COMPANY	- creation of an innovation culture and R&D through talent acquisition - introduction of sustainability goal	- address BMI holistically, - create alignment within the departments - implement sustainability methodologies.	- creation of spin offs and innovation teams, - share responsibility in the new teams, - internalize the core capabilities - implement corporate sustainability.
	EMPLOYEES	- innovation culture, - gather employees ideas, - create an intrapreneurial program	- alignment to the corporate strategy or the innovation team, - empowering the employee	- increasing responsibility and decision power of employees, - allow employees to implement their ideas
	SUPPLIERS	- continuously screen and assess suppliers innovations - use existing link with startup to find potential suppliers	- incentivize supplier innovation - apply sustainability standards to suppliers	- develop new capabilities together with suppliers - reconfigure supply chain according to new needs
EXTERNAL	CUSTOMERS	- include customers ideas and expectation via open innovation initiatives	- incorporate market research knowledge, - solve challenges with the help of customers - test features and ideas with customers	n/a
	PUBLIC STAKEHOLDERS	- Identification of external stakeholders - establishment of dialogue with stakeholders through specialized teams	- continuous feedback from stakeholder dialogue - creation of collective solutions	- implementation of collective solutions - partnership with local stakeholders
	STARTUPS	- creating different standardized processes to understand, screen and assess startup knowledge and BM	- teaching and mentoring startups, - collaborate to solve the company knowledge gap or capability need - learning the startup approach connected to agility and lean processes	- partnering up with startups, including startups in the supply chain or - acquiring startups to internalize missing capabilities
	INDUSTRY	- competitor analysis, - establish an open channel where companies can easily suggest collaborations	- co-learning and co-creation to pool resources and develop new capabilities	- partnership to source missing capabilities

Figure 4: Framework of the dynamic capabilities involved in eco-disruptive business model innovation.

6.6 Summary of Discussion

This section started by analyzing whether carsharing can be defined as a disruptive innovation. The conclusion of this analysis is that it is on a disruptive path and thus has the potential to be disruptive, but the BM is not mature enough to have actually disrupted the market. Then the analysis moves onto whether the BM can be defined as an eco-innovation. The same applies in this case as only a widespread adoption will make the BM environmentally sustainable, thus the BM has the potential to be an eco-disruptive innovation.

The section continues by recounting the main capabilities that BMW had to develop for the new BM. These are: switching from being a producer to a service provider, IT infrastructure and programming capabilities and fleet management capabilities.

The second part of the section answers the second subquestion, namely "*How are these processes implemented?"* where "these" are the processes described in the analysis. Then the implementation of the processes in the case of BMW is explained.

Some key concepts identified in the implementation of the processes are taken into consideration in order to introduce the final part. Finally, the implementation of the processes is compared with the analysis of the two frameworks and the difference between the case company implementation and the processes suggested in the frameworks are explained. This comparison is divided into seven categories which represent the stakeholders that have to be integrated in the transition. A framework is then created in order to facilitate future implementation of BMI for a company faced with eco-disruptive innovation.

7 CONCLUSION

7.1 Summary of the thesis

This thesis stems from the research in disruptive innovation and eco-innovation, two branches of research that have attracted large scale attention. On the one hand, disruptive innovation describes how some new technologies enter a market and despite delivering lower value in certain specific characteristics manage to become the mainstream technology. On the

other hand, eco-innovation describes technologies that reduce the environmental impact of production or consumption while sustaining economic returns.
The aim of the thesis is to study how to connect these two theories in the case of a company faced with innovation that has the characteristics of both disruptive innovation and eco-innovation at the same time.

In the first section of the thesis, the two theories are revised through a literature review and a gap is identified. Both theories suggest that for an established company to respond to such innovations, the company has to innovate on its business model. Moreover, both theories point to dynamic capabilities when faced with the question of how to perform such a business model innovation. The gap in the literature constitutes the unification of the two theories.
Having identified dynamic capabilities as the common unit of analysis for BMI, two dynamic capabilities frameworks pertaining to each branch of innovation theory are identified. Namely the framework of Inigo et al. (2017) from the paper "*Business model innovation for sustainability: exploring evolutionary and radical approaches through dynamic capabilities"* is chosen for eco-innovation and the framework of Mezger (2014) "*Toward a capability-based conceptualization of business model innovation: insights from an explorative study"* is chosen for disruptive innovation.

In order to perform the research and test whether the framework can be used to fill the gap identified, a research question with two sub questions are formulated:

- How is a company able to innovate its business model (BM) when faced with eco-disruptive innovation?
    - What sensing, seizing, reconfiguring processes does a company need to implement for the business model innovation (BMI)?
    - How are these processes implemented?

The thesis utilized the deductive research approach to test the theories and adjust the theories according to the findings. In order to test the theories a case study approach is chosen.

The automotive industry was identified as a good environment to study due to the recent introduction of many new technologies and business models (BM) and for the increasing regulations that force a transition toward environmental sustainability. Moreover the market

that has in the past been characterized by technological stability and only saw incremental improvements is now facing many new entrants and new demands from its customers.
BMW was identified as the case to research due to its adoption of a new BM that has the characteristics of disruptive innovation and eco-innovation. BMW represents an extreme case of exceptional innovator in its industry and has just adopted the BM of carsharing and is changing its main focus from selling products to providing services.

In order to gain more information on the case company, the researchers held an interview with the key informant Markus Krieg, at the time the Head of Mobility Services at BMW. The interview was based on open ended questions and aimed at gathering insights on the adoption of carsharing, the new capabilities that they needed to develop and the strategy for the future developments of BMW.
Based on these insights and the literature review, the researchers formulated a list of keywords and gathered 53 documents regarding the processes that BMW utilized in its transition from the old BM to the new one.
The documents were codified using content analysis and the software NVivo according to categories identified through the frameworks. The categories were for Inigo et al.'s (2017) framework (1) sustainability sensing, (2) sustainability seizing, (3) sustainability reconfiguring, and for Mezger (2014) framework (4) technology sensing, (5) technology seizing, and (6) technology reconfiguring.

In the section of the Analysis, the codified data was compared to the frameworks and it demonstrates that the two frameworks are insufficient for explaining BMW’s adoption of casharing business models. This is because each framework explains only one part of the processes and some processes were not explained as well as some synergies between the processes.

The first part of the discussion section discusses whether carsharing matches the characteristics of eco-disruptive innovation using data and literature review. It is found that this cannot yet be fully assessed as the BM of carsharing has not fully developed and large scale adoption has not yet been achieved. However, it was confirmed that carsharing does possess all major characteristics of both disruptive innovation and eco-innovation. As such, it

can be defined as potentially disruptive eco-innovation and it proves to be a valid case for this research.

The second part of the discussion explains how and why BMW implemented the processes by going through them in chronological order. The focus of this section lies in explaining the relationships between the different projects, ventures and collaborations, how BMW was able to benefit from synergies between them and the processes implemented to innovate on its business model.

The third part of the discussion is a comparison of the analysis and the explanation of the implementation of the processes. The findings are then transposed into a framework for clarity and easier understanding. This framework is built on the taxonomy of Teece (2007) and on the identification of seven different stakeholders: (1) company, (2) employees, (3) suppliers, (4) customers, (5) public stakeholders, (6) startups, and (7) industry.

7.2. Managerial Implications

The framework created at the end of the thesis is an adaptation from the two existing frameworks. Since it is based on the comparison of the case of BMW, a leader in innovation and a successful company in its industry, with the theory, the results of the analysis that have been integrated in the new framework represent best practices and are thus very likely to prove valuable practical to implement. The main takeaway from the framework is the integration of multiple external stakeholders in the process of innovation. Because the analysis focuses on the processes in which each stakeholder is involved, the framework ends up being very detailed. The steps described suggest to structure the processes in such a way to allow the maximum amount of knowledge to reach the company and to have structured ways of understanding this knowledge. Then the focus is on continuous feedback and co-learning activities and finally on partnerships and collaborations to restructure the resources of the company and develop new ones.

Finally, when the industry is undergoing much change and is facing global challenges, collaboration, even with competitors, is needed to reach collective solutions.

Since the processes are taken from the case company, which represents an extreme example of exceptional innovator, it might not be easy to implement the same processes in other companies. Nonetheless, when the processes are implemented, they should focus on inclusion of stakeholders, creation of absorptive capacity and ability to handle change through ambidexterity.

The utilization of this approach by multiple actors, should foster eco innovation and market disruption on a global scale and can help the transition toward a more environmentally sustainable economy.

7.3. Implications for Researchers

This thesis provides a few implications for research. First of all, the lack of connection between disruptive innovation and eco innovation demands more research in order to fill the gap, as both fields are growing in importance and in utilization in real world scenarios. This field of research might prove of incredible value for the future studies of the innovations that are characteristics of the transition toward an environmentally sustainable economy. Secondly, the framework created by the thesis needs to be tested with other cases and in other industries in order to prove its generalizability and adjust it if necessary. Since dynamic capabilities are context specific and as such the processes are implemented differently according to the industry and specific company context, the study of other contexts might prove or disprove the findings of this thesis but in any case would contribute to the foundations of this new field of research.

Third, this thesis suggests that more importance has to be given to stakeholder inclusion and that dynamic capabilities have to be researched for every stakeholder involved in the process of transition. The process of innovation does not have to come from the company itself or from the internal network, but has to include knowledge and satisfy the needs of all the stakeholders including the external ones. This concept is aligned with sustainability, that aims at integrating the environment as a stakeholder that has to be taken into consideration and whose needs need to be satisfied. In general, this thesis suggests that an inclusive approach that seeks to solve global problems through collective solutions needs to be taken also in theoretical research.

8 BIBLIOGRAPHY

8.1 References

- Acquier, A., Daudigeos, T., Pinkse, J., 2017. Promises and paradoxes of the sharing economy: An organizing framework. *Technological Forecasting and Social Change, Elsevier vol. 125, 1-10*.
- Adams, R., S. Jeanrenaud, J. Bessant, D. Denyer, and P. Overy. 2016. "Sustainability-oriented Innovation: A Systematic Review." *International Journal of Management Reviews, vol. 18 (2): 180–205.*
- Adner, R. & Kapoor, R. (2016). Innovation ecosystems and the pace of substitution: Re-examining technology S-curves. *Strategic Management Journal, 37(4).*
- Adner, R. & Snow, D. (2010). "Old" Technology Responses to New Technology Threats: Demand Heterogeneity and Graceful Technology Retreats. *Industrial & Corporate Change, 19(5).*
- Amit, R., and Ch. Zott. 2012. "Creating Value through Business Model Innovation." *MIT Sloan Management Review, vol. 53 (3): 41–49.*
- Anthony, S.D., Glibert, C. & Johnson, M.W. (2017). Dual Transformation: How to Reposition Today's Business While Creating the Future. *Boston: Harvard Business Review Press.*
- Arndt, F. & Pierce, L. (2018). The behavioral and evolutionary roots of dynamic capabilities. *Industrial and Corporate Change, 27(2).*
- Assink, M. (2006). Inhibitors of disruptive innovation capability: a conceptual model. *European Journal of Innovation Management, 9(2).*
- Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management, 17(1).*
- Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management, 36(1).*
- Belk, R. (2010). Sharing. *Journal of Consumer Research, Volume 36, Issue 5, February 2010, Pages 715–734*
- Benkler, Y. (2017). Peer production, the commons, and the future of the firm. *Strategic Organization, 15(2), 264–274.*
- Bento Nunto (2010) Is carbon lock-in blocking investments in the hydrogen economy? A survey of actors' strategies. *Energy policy 38, 7189-7199.*

- Bocken, N. M. P., S. W. Short, P. Rana, and S. Evans. 2014. "A Literature and Practice Review to Develop Sustainable Business Model Archetypes." *Journal of Cleaner Production 65: 42–56.*
- Bohnsack, R., Pinkse, J., Kolk, A., 2014. Business models for sustainable technologies: exploring business model evolution in the case of electric vehicles. *Research Policy. 43, 284-300.*
- Boons, F., and F. Lüdeke-Freund. 2013. "Business Models for Sustainable Innovation: State-of-the-Art and Steps towards a Research Agenda." *Journal of Cleaner Production 45: 9–19.*
- Bower, J.L. & Christensen, C.M. (1995). Disruptive technologies: Catching the wave. *Harvard Business Review, January-February.*
- Brisbourne A. (2014). Tesla's Over-The-Air fix: Best Example Yet of the Internet of Things yet? *Wired online. February 2014. Available from: https://www.wired.com/insights/2014/02/teslas-air-fix-best-example-yet-internet-things/.*
- Breznik, L. & Hisrich, R. (2014). Dynamic capabilities vs. innovation capability: are they related?. *Journal of Small Business and Enterprise Development, 21(3).*
- Breznik, L. & Lahovnik, M. (2016). Dynamic capabilities and competitive advantage: Findings from case studies. *Journal of Contemporary Management Issues, 21(special issue).*
- Cai, W. & Li, G. (2018). The drivers of eco-innovation and its impact on performance: Evidence from China. *Journal of Cleaner Production, 176.*
- Casadesus-Masanell, R., and J. E. Ricart. 2010. "From Strategy to Business Models and onto Tactics." *Long Range Planning 43 (2–3): 195–215.*
- Cecere, G., Corrocher, N., Gossart, C. & Ozman, M. (2014). Lock-in and path dependence: an evolutionary approach to eco-innovations. *Journal of Evolutionary Economics, 24(5).*
- Chen, Y. S., S. B. Lai, and C. T. Wen. 2006. "The Influence of Green Innovation Performance on Corporate Advantage in Taiwan." *Journal of Business Ethics 67 (4): 331–339.*
- Christensen, C.M. (1997). The Innovator's Dilemma. *Boston: Harvard Business School Press.*

- Christensen, C.M. (2006). The Ongoing Process of Building a Theory of Disruption. *Journal of Product Innovation Management, 23.*
- Christensen, C.M., McDonald, R., Altman, E.J. & Palmer, J.E. (2018). Disruptive Innovation: An Intellectual History and Directions for Future Research. *Journal of Management Studies, 55(7).*
- Christensen, C.M. & Raynor, M. (2003). The Innovator's Solution. *Boston: Harvard Business School Press.*
- Christensen, C.M., Raynor, M. & McDonald, R. (2015). What Is Disruptive Innovation. *Harvard Business Review, 93(12).*
- Christensen, C.M., Grossman, J.H. & Hwang, J. (2009). The Innovator's Prescription: A Disruptive Solution for Health Care. *McGraw-Hill.*
- Ciulli F. and Kolk A., 2018. Incumbents and Business model innovation for the sharing economy: Implications for sustainability. *Journal of Cleaner Production (2018).*
- Cozzolino, A., Verona, G. & Rothaermel, F.T. (2018). Unpacking the Disruption Process: New Technology, Business Models, and Incumbent Adaptation. *Journal of Management Studies, 55(7).*
- Crotty, M. (1998). The foundation of social research: Meaning and perspective in the research process. *London: Sage Publications.*
- Cruz-González, J., Navas-López, J.E., López-Sáez, P. & Delgado-Verde, M. (2012). Dynamic Capabilities and Innovation Radicalness: Review and Analysis. Chapter 11 in Nobre, F.S., Walker D. & Harris, R. (2012). Technological, Managerial and Organizational Core Competencies: Dynamic Innovation and Sustainable Development. *IGI Global.*
- Dahan, N. M., J. P. Doh, J. Oetzel, and M. Yaziji. 2010. "Corporate–NGO Collaboration: Co-creating New Business Models for Developing Markets." *Long Range Planning 43 (2–3): 326–342.*
- Danneels, E. (2004). Disruptive Technology Reconsidered: A Critique and Research Agenda. *Journal of Product Innovation Management, 21(4).*
- Danneels, E. (2008). Organizational antecedents of second-order competences. *Strategic Management Journal, 29(5).*

- David J. Teece (2018). Tesla and the Reshaping of the Auto Industry. *Management and Organization Review 14:3, September 2018, 501–512.*
- De Jesus, A., Antunes, P., Santos, R. & Mendonca, S. (2018). Eco-innovation in the transition to a circular economy: An analytical literature review. *Journal of Cleaner Production, 172.*
- Demil, B., and X. Lecocq. 2010. "Business Model Evolution. in Search of Dynamic Consistency." *Long Range Planning 43 (2–3): 227–246.*
- Eccles, R. G., and G. Serafeim. 2013. "The Performance Frontier." *Harvard Business Review 91 (5): 50–60.*
- Fine, C. H. (2000). Clockspeed-based strategies for supply chain design. *Production and Operations Management, 9(3), 213—221.*
- Firnkorn J., Shaheen S. (2015) Generic time- and method-interdependencies of empirical impact- measurements: A generalizable model of adaptation-processes of carsharing-users' mobility-behavior over time. *Journal of Cleaner Production 113 (2016) 897-909.*
- Flick, U. (2010). An Introduction to Qualitative Research. *London: Sage Publications Ltd.*
- Frenken, K., Schor, J., 2017. Putting the sharing economy into perspective. *Environmental Innovation and Societal Transition 23, 3-10.*
- Fuentelsaz, L., Garrido, E., Maicas, J. P., 2015. Incumbents, technological change and institutions: How the value of complementary resources varies across markets. *Strategic Management Journal 36, 1778-1801.*
- García-Granero, E.M., Piedra-Manoz, L. & Galdeano-Gómez, E. (2018). Eco-innovation measurement: A review of firm performance indicators. *Journal of Cleaner Production, 191.*
- Gazzola, P. (2017). Behind the Sharing Economy: Innovation and Dynamic Capability. Chapter 5 in Vătămănescu, E. & Pînzaru, F.M. (2017). Knowledge Management in the Sharing Economy: From Concept to Practice. *Springer International Publishing AG.*
- Geels, F.W., (2005). The Dynamics of Transitions in Socio-technical Systems: A Multi-level Analysis of the Transition Pathway from Horse-drawn Carriages to

Automobiles (1860 – 1930) *Technology Analysis & Strategic Management Vol. 17, No. 4, 445–476*.

- Geels, F. W. 2010. "Ontologies, Socio-technical Transitions (to Sustainability), and the Multi-level Perspective." *Research Policy 39 (4): 495–510.*
- George, G., A. M. McGahan, and J. Prabhu. 2012. "Innovation for Inclusive Growth: Towards a Theoretical Framework and a Research Agenda." *Journal of Management Studies 49 (4): 661–683.*
- Govindarajan, V., & Kopalle, P.K (2006). Disruptiveness of innovations: measurement and an assessment of reliability and validity. *Strategic Management Journal 27(2)*.
- Habibi, M.R., Kim, A., Laroche, M., 2016. From sharing to exchange: an extended framework of dual modes of collaborative nonownership consumption. *Journal of the Association for Consumer Research, vol. 1, issue 2, 277 - 294.*
- Halme, M., Lindeman, S., Linna, P., 2012. Innovation for inclusive business: Intrapreneurial bricolage in multinational corporations. *Journal of Management Studies. Vol. 49, issue 4, 743-784.*
- Harrison, D., J. L. Klein, and P. L. Browne. 2011. "Social Innovation, Social Enterprise and Services." *In The Handbook of Innovation and Services, edited by F. Gallouj and F. Djellal, 197–218. Edward Elgar.*
- He, F., Miao, X., Wong, C.W.Y. & Lee, S. (2018). Contemporary corporate eco-innovation research: A systematic review. *Journal of Cleaner Production, 174.*
- Ho, J.C. & Chen, H. (2018). Managing the Disruptive and Sustaining the Disrupted: The Case of Kodak and Fujifilm in the Face of Digital Disruption. *Review of Policy Research, 35(3).*
- Horbach, J., V. Oltra, and J. Belin. 2013. "Determinants and Specificities of Eco-innovations Compared to Other Innovations – An Econometric Analysis for the French and German Industry Based on the Community Innovation Survey." *Industry and Innovation 20 (6): 523–543.*
- Inigo, E.A., Albareda, L. & Ritala, P. (2017). Business model innovation for sustainability: exploring evolutionary and radical approaches through dynamic capabilities. *Industry and Innovation, 24(5).*

- Intergovernmental Panel on Climate Change Groupe Intergouvernemental (IPCC), (2007). Climate Change 2007: The Physical Science Basis. Summary for Policymakers. *10th Session of Working Group I (WG I), Paris, February.*
- International Energy Agency (IEA), 2009. Transport, Energy and CO2: Moving Toward Sustainability. *IEA/OECD, Paris. Available at: http://www.ipcc.ch*
- Kammerlander, N., König, A. & Richards, M. (2018). Why Do Incumbents Respond Heterogeneously to Disruptive Innovations? The Interplay of Domain Identity and Role Identity. *Journal of Management Studies, 55(7).*
- Karimi, J. & Walter, Z. (2015). The Role of Dynamic Capabilities in Responding to Digital Disruption: A Factor-Based Study of the Newspaper Industry. *Journal of Management Information Systems, 32(1).*
- Karimi, J. & Walter, Z. (2016). Corporate Entrepreneurship, Disruptive Business Model Innovation Adoption, and Its Performance: The Case of the Newspaper Industry. *Long Range Planning, 49.*
- Kemp, R., Schot, J., Hoogman, R., (1998). Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. *Technology Analysis & Strategic Management 10 (2), 175–195*.
- Khanagha, S., Ramezan Zadeh, M.T., Mihalache, O.R. & Volberda, H.W. (2018). Embracing Bewilderment: Responding to Technological Disruption in Heterogeneous Market Environments. *Journal of Management Studies, 55(7).*
- Kiefer, C.P., Carrillo-Hermosilla, J., Del Río, P. & Callealte Barroso, F.J (2017). *Journal of Cleaner Production, 166.*
- Kiefer, C.P., Del Río González, P. & Carrillo-Hermosilla, J. (2019). Drivers and barriers of eco‐innovation types for sustainable transitions: A quantitative perspective. *Business Strategy and the Environment, 28(1).*
- Kiron, D., N. Kruschwitz, M. Reeves, and E. Goh. 2013. "The Benefits of Sustainability-driven Innovation." *MIT Sloan Management Review 54 (2): 69–73.*
- Klewitz, J., and E. G. Hansen. 2014. "Sustainability-oriented Innovation of SMEs: A Systematic Review." *Journal of Cleaner Production 65: 57–75.*
- KPMG. (2013). Self-driving cars: Are we ready? [White paper]. *Available at http://docplayer.net/33713-Self-driving-cars- are-we-ready-kpmg-com.html*

- KPMG. (2014). Me, my car, my life . . . In the ultra-connected age [White paper]. *Available at* *https://assets.kpmg.com/content/dam/kpmg/pdf/2014/11/me-my-life-my-car.pdf*
- Kumaraswamy, A., Garud, R. & Ansari, S. (2018). Perspectives on Disruptive Innovations. *Journal of Management Studies, 55(7).*
- Laukkanen M. and Patala S. (2014). Analyzing barriers to Sustainable Business Model Innovation: innovation System Approach. *International Journal of Innovation Management Vol. 18, No. 6 (December 2014) 1440010 (21 pages).*
- Leavy, B. (2017). Two strategies for innovation in the face of market disruption. *Strategy & Leadership, 45(4).*
- Lee, C., Wu, K. & Tseng, M. (2018). Resource management practice through eco-innovation toward sustainable development using qualitative information and quantitative data. *Journal of Cleaner Production, 202.*
- Lincoln, Y.S. & Guba, E.G. (1985). Naturalistic inquiry. *Beverly Hills: Sage.*
- Lunden, I. (2013, July 12). A new place for Better Place, as bankrupt $800M+ backed electric car startup sold for $12M. *TechCrunch. Available at https://techcrunch.com/2013/07/12/a-new-place-for-better-place-as-bankrupt-800m-backed-electric-car-startup-sold-for-12m/?ncid=tcdaily*
- Ludwig, G & Pemberton, J. (2011). A managerial perspective of dynamic capabilities in emerging markets: the case of the Russian steel industry. *Journal of East European Management Studies, 16(3).*
- Macron, A., de Medeiros, J.F. & Ribeiro, J.L.D. (2017). Innovation and environmentally sustainable economy: identifying the best practices developed by multinationals in Brazil. *Journal of Cleaner Production, 160.*
- Matzler, K., F. Bailom, S. Friedrich von den Eichen, and T. Kohler. 2013. "Business Model Innovation: Coffee Triumphs for Nespresso." *Journal of Business Strategy 34 (2): 30–37.*
- Mazzanti, M. (2018). Eco-innovation and sustainability: dynamic trends, geography and policies. *Journal of Environmental Planning and Management, 61(11).*

- McKinsey & Company. (2016, January). Automotive revolution—– Perspective towards 2030. *Available at https://www.mckinsey.de/files/automotive_revolution_perspective_ towards_2030.pdf*
- McNutt, B., Rodgers, D., 2004. Lessons learned from 15 years of alternative fuels experience—1988 to 2003. In: Sperling, D., Cannon, J. (Eds.), *The Hydrogen Energy \ Transition—Moving Toward the Post Petroleum Age in Transportation*. *Amsterdam Elsevier*.
- Melaina, M.W., (2007). Turn of the century refueling: a review of innovations in early gasoline refueling methods and analogies for hydrogen. *Energy Policy 33, 4919–4934.*
- Mezger, F. (2014). Toward a capability-based conceptualization of business model innovation: insights from an explorative study. *R&D Management, 44(5).*
- Motta, W.H., Issberner, L. & Prado, P. (2018). Life cycle assessment and eco-innovations: What kind of convergence is possible? *Journal of Cleaner Production, 187.*
- Murillo, D., Buckland, H., Val, E., 2017. When the sharing economy becomes neoliberalism on steroids: Unravelling the controversies. *Technological Forecasting and Social Change, Elsevier, vol. 125(C), pages 66-76.*
- Nagy, D., Schuessler, J. & Dubinsky, A. (2016). Defining and identifying disruptive innovations. *Industrial Marketing Management, 57.*
- Nidumolu, R., C. K. Prahalad, and M. R. Rangaswami. 2009. "Why Sustainability is Now a Key Driver of Innovation." *Harvard Business Review 87 (9): 57–64.*
- O'Reilly, C.A. & Tushman, M.L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior, 28.*
- Pablo, A.L., Reay, T., Dewald, J.R., & Casebeer, A.L. (2007). Identifying, enabling and managing dynamic capabilities in the public sector. *Journal of Management Studies, 44(5).*
- Palgan, Y. V., Zvolska, L., Mont, O., 2017. Sustainability framings of accommodation sharing. *Environmental Innovation and Societal Transitions, Vol. 23, 06.2017, p. 70-83.*

- Perkins, G., & Murmann, J. P. (2018). What does the success of Tesla mean for the future dynamics in the global automobile sector? *Management and Organization Review, 14(3).*
- Plewnia, F., Guenther, E., 2018. Mapping the sharing economy for sustainability research. *Management Decision 56, 570-583.*
- Porter, M. E. (1989). From competitive advantage to corporate strategy. *In D. Asch & C. Bowman (Eds.), Readings in strategic management (pp. 234—255).*
- PricewaterhouseCoopers. (2017). *2016 Global Innovation 1000 study. Available at https://www.strategyand.pwc. com/innovation1000*
- Pujari, D. 2006. "Eco-innovation and New Product Development: Understanding the Influences on Market Performance." *Technovation 26 (1): 76–85.*
- Qaiyum, S. & Wang, C.L. (2018). Understanding internal conditions driving ordinary and dynamic capabilities in Indian high-tech firms. *Journal of Business Research, 90*.
- Roy, R. & Cohen, S.K. (2015). Disruption in the US machine tool industry: The role of inhouse users and pre-disruption component experience in firm response. *Research Policy, 44(8).*
- Roy, R., Sarkar, M. B., 2016. Knowledge, firm boundaries, and innovation: Mitigating the incumbent's curse during radical technological change. *Strategic Management Journal 37, 835-854.*
- Salim, N., Ab Rahman, M.N. & Wahab, D.A. (2019). A systematic literature review of internal capabilities for enhancing eco-innovation performance of manufacturing firms. *Journal of Cleaner Production, 209.*
- Sandström, C., Magnusson, M. & Jörnmark, J. (2009). Exploring Factors Influencing Incumbents' Response to Disruptive Innovation. *Creativity and Innovation Management, 18(1).*
- Saunders, M., Lewis, P. & Thornhill, A. (2009). Research methods for business students. *Harlow: Pearson Education Limited.*
- Schafer, A., Heywood, J.B., Weiss, M.A., 2006. Future fuel cell and internal combustion engine automobile technologies: a 25-year life cycle and fleet impact assessment. *Energy 31, 2064–2087.*

- Schaltegger, S., Ludeke-Freund, F., Hansen, E., 2016. Business Models for Sustainability: a co-evolutionary analysis of sustainable entrepreneurship, innovation and transformation. *Organization & Environment, 29(3), 264–289.*
- Shuen, A. & Sieber, S. (2009). Orchestrating the New Dynamic Capabilities. *IESE Insight Review (3).*
- Sosna, M., Trevinyo-Rodríguez, R. N., Velamuri, S. R., 2010. Business model innovation through trial- and-error learning: The Naturhouse case. *Long Range Planning 43, 383-407.*
- Stahel, WR (2007). Resource-miser business models. *International Journal of Environmental Technology and Management, 7(5–6), 483–495.*
- Stubbs, W., and C. Cocklin. 2008. "Conceptualizing a 'Sustainability Business Model'." *Organization & Environment 21 (2): 103–127.*
- Swan, M. (2015). Connected car: Quantified self becomes quantified car. *Journal of Sensor and Actuator Networks, 4(1), 2—29.*
- Tarnawska, K. (2013). ECO-INNOVATIONS – TOOLS FOR THE TRANSITION TO GREEN ECONOMY. *Economics and Management,18(4).*
- Teece, D.J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research policy, 15(6).*
- Teece, D.J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28(13).*
- Teece, D. J. 2010. "Business Models, Business Strategy and Innovation." *Long Range Planning 43 (2–3): 172–194.*
- Teece, D.J., Pisano, G. & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18(7).*
- The Economist (2016) Uberworld, September 3, 2016.
- Tsai, K. & Liao, Y. (2017). Innovation Capacity and the Implementation of Eco‐innovation: Toward a Contingency Perspective. *Business Strategy and the Environment, 26(7).*
- Unruh, G.C., (2000). Understanding carbon lock-in. *Energy Policy, 28, 817–830.*
- Unruh, G.C., (2002). Escaping carbon lock in. *Energy Policy 30, 317–325.*
- Varian, H. R., & Shapiro, C. (1998). Information rules: A strategic guide to the network economy. *Brighton, MA: Harvard Business Review Press.*

- Vazquez Sampere, J.P. (2016). Why Platform Disruption Is So Much Bigger than Product Disruption. *Harvard Business Review.*
- Voelpel, S. C., M. Leibold, and E. B. Tekie. 2004. "The Wheel of Business Model Reinvention: How to Reshape Your Business Model to Leapfrog Competitors." *Journal of Change Management 4 (3): 259–276.*
- Vriens, D. & Søilen, K.S. (2014). Disruptive Intelligence - How to gather Information to deal with disruptive innovations. *Journal of Intelligence Studies in Business, 4(3).*
- Wadin J. Ahlgren, K., Bengtsson, L., 2017. Joint business model innovation for sustainable transformation of industries – a large multinational utility in alliance with a small solar energy company. *Journal of Cleaner Production, 160, 139-150.*
- Wagner, M., and P. Llerena. 2011. "Eco-innovation through Integration, Regulation and Cooperation: Comparative Insights from Case Studies in Three Manufacturing Sectors." *Industry and Innovation 18 (8): 747–764.*
- Weeks, M.R. (2015). Is disruption theory wearing new clothes or just naked? Analyzing recent critiques of disruptive innovation theory. *Innovation, 17(4).*
- World Business Council for Sustainable Development (WBCSD), 2004. Mobility 2030: Meeting the Challenges to Sustainability, Available at: *http://www.wbcsd.ch*
- Xavier, A.F., Naveiro, R.M., Aoussat, A. & Reyes, T. (2017). Systematic literature review of eco-innovation models: Opportunities and recommendations for future research. *Journal of Cleaner Production, 149.*
- Xavier Ferràs-Hernández, Elisenda Tarrats-Pons, Núria Arimany-Serrat, (2017). Disruption in the automotive industry: A Cambrian moment. *Business Horizons Volume 60, Issue 6, November–December 2017, Pages 855-863*
- Yin, R.K. (2003). Case Study Research: Design and Methods. *London: Sage Publications.*
- You, D., Zhang, Y. & Yuan, B. (2019). Environmental regulation and firm eco-innovation: Evidence of moderating effects of fiscal decentralization and political competition from listed Chinese industrial companies. *Journal of Cleaner Production, 207.*
- Zott, C. 2003. Dynamic capabilities and the emergence of intraindustry differential firm performance: Insights from a simulation study. *Strategic Management Journal, 24(2).*

- Zott, C., R. Amit, and L. Massa. 2011. "The Business Model: Recent Developments and Future Research." *Journal of Management 37 (4): 1019–1042.*
- Zubeltzu-Jaka, E., Erauskin-Tolosa, A. & Heras-Saizarbitoria, I. (2018). Shedding light on the determinants of eco‐innovation: A meta‐analytic study. *Business Strategy and the Environment, 27(7).*
- Zúñiga-Vicente, J.Á. & Vicente-Lorente, J.D. (2006). Strategic moves and organizational survival in turbulent environments: The Case of Spanish Banks (1983-97). *Journal of Management Studies, 43(3).*

8.2 Data Document Analysis

Code	Title	Date	Author	Link
D01	Corporate Innovation: What Your Company Can Learn From BMW's Innovation Strategy	29.03. 2017	Maria Aleida	https://www.steelcase.com/research/articles/topics/innovation/bmw-driving-innovation/
D02	The importance of creativity and innovation - and how BMW is driving both	19.10. 2017	Shané Schutte	https://realbusiness.co.uk/the-importance-of-creativity-and-innovation-and-how-bmw-is-driving-both/
D03	Innovation Management at BMW	05.11. 2016	n/a	https://lakshmee14.blogspot.com/2016/11/innovation-management-at-bmw.html
D04	Sustainable Innovation in BMW's Business Model Canvas	16.05. 2017	Jan van der Kaaij	https://www.finchandbeak.com/1048/sustainable-innovation-bmw-business-model.htm
D05	BMW Group Launches UK Innovation Lab 2018	n/a	n/a	https://lmarks.com/bmw-group-launches-uk-innovation-lab-2018-automotive-entrepreneurs-intrapreneurs/
D06	BASF is most sustainable innovation partner for BMW	15.11. 2018	Sarah Rummel	https://www.basf.com/global/en/media/news-releases/2018/11/p-18-387.html
D07	How BMW put innovation in the driver's seat	20.03. 2014	n/a	https://www.uts.edu.au/about/uts-business-school/news/how-bmw-put-innovation-drivers-seat

D08	Customer Co-Creation Examples: 10 Companies Doing It Right	20.03. 2019	Alexis Fournier	https://www.braineet.com/blog/co-creation-examples/
D09	Why BMW's Startup Garage Invented the Venture Client Model	25.08. 2016	n/a	https://blog.markgrowth.com/why-bmws-startup-garage-invented-the-venture-client-model-a6e5c4da2559
D10	How BMW is innovating for the next generation of drivers	11.07. 2019	Matthew Beedham	https://thenextweb.com/tnw2019/2019/04/26/how-bmw-is-innovating-its-business-to-build-cars-for-the-future/
D11	Open Innovation Fuels BMW's Ideation Process	14.05. 2012	n/a	https://www.ideaconnection.com/open-innovation-success/Open-Innovation-Fuels-BMW-s-Ideation-Process-00349.html
D12	Driving Corporate Innovation at BMW	08.01. 2019	Sarah Finch	https://disruptionhub.com/driving-corporate-bmw-innovation-lab/
D13	BMW | World Branding Awards	n/a	n/a	https://awards.brandingforum.org/brands/bmw/
D14	Level up: Why we cooperate with BMW on automated driving	28.02. 2019	Michael Hafner	https://blog.daimler.com/en/2019/02/28/mercedes-bmw-automated-driving-joint-venture-cooperation/
D15	BMW versus Tesla: Who is going to win?	20.10. 2017	Patrick van der Pijl	https://designabetterbusiness.com/2017/10/20/business-model-canvas-tesla-bmw/
D16	6 business model shifts to explore	n/a	Patrick van der Pijl	https://www.businessmodelsinc.com/business-model-shifts-blog/
D17	Place your bets: BMW is running one heck of an innovation race	24.10. 2016	Miles Branman	https://www.digitaltrends.com/cars/place-your-bets-bmw-is-running-one-heck-of-an-innovation-race/
D18	BMW shifts focus towards harnessing technology	16.03. 2016	n/a	https://www.reuters.com/article/us-bmw-strategy-results/bmw-shifts-focus-towards-harnessing-technology-idUSKCN0WI115
D19	BMW Group launches UK Innovation Lab 2018 for automotive entrepreneurs & intrapreneurs	25.09. 2017	n/a	https://www.technative.io/bmw-group-launches-uk-innovation-lab-2018-for-automotive-entrepreneurs-intrapreneurs/

D20	Interview with Ursula Mathar, VP BMW Group	07.08. 2017	William Brittlebank	http://www.climateaction.org/climate-leader-interviews/interview-with-ursula-mathar-vp-bmw-group
D21	BMW's closed-loop batteries and AI-powered beehives - The best innovations for Green GB Week	19.10. 2018	n/a	https://www.edie.net/news/8/BMW-s-circular-batteries-and-beehives-based-on-AI--The-best-innovations-for-Green-GB-Week/
D22	BMW, Daimler Join Forces in $1.1 Billion Ride-Hailing, Car-Sharing Deal	25.02. 2019	David Killey	https://www.forbes.com/sites/davidkiley5/2019/02/25/bmw-daimler-team-up-in-1-1-billion-ride-hailing-car-sharing-deal/#199e4a7f171b
D23	Daimler and BMW Plan $1.1 Billion Uber Battle	22.02. 2019	Christoph Rauwald & Oliver Sachgau	https://www.bloomberg.com/news/articles/2019-02-22/daimler-bmw-to-battle-uber-with-1-1-billion-mobility-push
D24	Alphabet delivered 250 BMW i3's for Poland's biggest electric carsharing project	02.04. 2019	Malgorzata Kenig	https://www.alphabet.com/en-pl/news/alphabet-delivered-250-bmw-i3s-polands-biggest-electric-carsharing-project
D25	BMW the most sustainable corporation in the world, according to Corporate Knights	26.01. 2016	Ryan Hewlett	https://www.wearesalt.org/bmw-the-most-sustainable-corporation-in-the-world-according-to-corporate-knights/
D26	BMW recognizes Arkema's technical polymers for sustainability	05.12. 2018	n/a	https://www.arkema.com/en/media/news/news-details/BMW-recognizes-Arkemas-technical-polymers-for-sustainability/
D27	Interview with BMW: lack of trust is the main challenge to overcome in industry collaboration	12.12. 2018	n/a	https://drivesustainability.org/mediaroom/collaboration-lack-of-trust-is-the-main-challenge-to-overcome/
D28	DSM, BMW and Steelcase on How to Measure the Effects of Products on Society	05.02. 2015	n/a	https://www.pre-sustainability.com/news/dsm-bmw-steelcase-how-to-measure-the-effects-of-products-on-society
D29	We speak with Dr. Andreas Aumann to learn more about BMW's vision of the future - more connected, more sustainable and more emotional.	12.07. 2019	n/a	https://www.sgcarmart.com/news/events_features.php?AID=3743

D30	DriveNow - a smaller player, but a profitable one	n/a	n/a	https://www.fleeteurope.com/en/smart-mobility/europe/features/drivenow-smaller-player-profitable-one?a=FJA05&t%5B0%5D=BMW&t%5B1%5D=DriveNow&t%5B2%5D=ReachNow&curl=1
D31	BMW ReachNow car-sharing service shuts down in Seattle and Portland following joint venture deal	17.07. 2019	Taylor Soper	https://www.geekwire.com/2019/bmw-reachnow-shuts-car-sharing-service-seattle-portland-following-joint-venture-deal/
D32	Innovative Mobility Services: DriveNow/car2go, ParkNow and BMW CarData	07.10. 2017	n/a	https://www.mobility-services.in.tum.de/?p=3655
D33	Ground innovation, part 2: A new model for car rental	11.03. 2019	Mitra Sorrells	https://www.phocuswire.com/Ground-transportation-part-2-car-rental
D34	Sixt plans to enter car-sharing market following the sale of its stake in DriveNow	19.03. 2018	n/a	https://www.autovistagroup.com/news-and-insights/sixt-plans-enter-car-sharing-market-following-sale-its-stake-drivenow
D35	Enhancing Mobility Services for BMW	n/a	n/a	http://www.kadoi.design/bmw
D36	BMW launches ReachNow car-sharing in China with EVCard	04.12. 2017	Hao Yan	http://www.chinadaily.com.cn/cndy/2017-12/04/content_35189886.htm
D37	Inside the abrupt shutdown of BMW's ReachNow car-sharing service in Seattle and Portland	05.08. 2019	Monica Nickelsburg	https://www.geekwire.com/2019/inside-abrupt-shutdown-bmws-reachnow-car-sharing-service-seattle-portland/
D38	Car-Sharing Application relies on HiveMQ for Reliable Connectivity	n/a	n/a	https://www.hivemq.com/case-studies/bmw-mobility-services/
D39	How shared mobility is changing car hardware	n/a	n/a	https://www.lead-innovation.com/english-blog/shared-mobility
D40	Crowd Revved Up by BMW Open Innovation Contest	18.02. 2013	n/a	https://www.ideaconnection.com/open-innovation-success/Crowd-Revved-Up-by-BMW-Open-Innovation-%20Contest-00399.html
D41	BMW head of digital customer: "Innovation will not stand still	08.11. 2018	Arjen Bongard	https://www.automotiveit.com/connected-car/bmw-head-of-digital-cu

	because car cycles are too long"			stomer-innovation-will-not-stand-still-because-car-cycles-are-too-long/5696.article
D42	The Disruption of Shared Mobility in an Autonomous World	02.04.2017	n/a	http://movmi.net/shared-mobility-autonomous-cars/
D43	BMW Recognized As Innovative And Sustainable	26.06.2013	Philippe Crowe	https://www.hybridcars.com/bmw-recognized-as-innovative-and-sustainable/
D44	DriveNow and Total Launch Digital Payment System in Hamburg	20.04.2017	n/a	https://de.total.com/en/home/media/list-news/drivenow-and-total-launch-digital-payment-system-hamburg
D45	BMW: From DriveOwn to DriveNow	13.11.2016	Roger Lanctot	https://www.strategyanalytics.com/strategy-analytics/blogs/infotainment-telematics/2016/11/13/bmw-from-driveown-to-drivenow
D46	Car-sharing: Will digital innovation spell the end of the road for ownership?	n/a	n/a	http://www.makeable.com/unconventional-wisdom/car-sharing-digital-innovation-in-car-ownership/
D47	BMW, Sixt and OP bring smart car sharing service DriveNow to Helsinki	16.07.2017	n/a	https://www.helsinkibusinesshub.fi/bmw-sixt-and-op-bring-smart-car-sharing-service-drivenow-to-helsinki/
D48	Arriva partners with BMW for car sharing	26.08.2015	n/a	http://www.passengertransport.co.uk/2015/08/arriva-partners-with-bmw-for-car-sharing/
D49	BMW - Drive now, analyze later?	18.11.2016	n/a	https://digital.hbs.edu/platform-rctom/submission/bmw-drive-now-analyze-later/
D50	BMW Group launches ride-hailing business based in Chengdu	17.12.2018	n/a	https://www.greencarcongress.com/2018/12/20181217-bmwchina.html
D51	400 BMW i3's Headed For DriveNow Car Sharing Service in Copenhagen	20.08.2015	Mark Kane	https://insideevs.com/news/328389/400-bmw-i3s-headed-for-drivenow-car-sharing-service-in-copenhagen/
D52	BMW's Launching an Uber Competitor in Seattle	17.01.2018	Aarian Marshall	https://www.wired.com/story/bmw-reachnow-ride-hailing-seattle/

D53	Iberdrola and BMW Launch Corporate Electric Car-Sharing Service	12.02. 2015	n/a	https://www.iberdrola.com/press-room/news/detail/iberdrola-and-bmw-launch-corporate-electric-car-sharing-service-8887111720150209

8.3 BMW's Public Statements

Code	Title	Date	Link
BMW01	BMW Group | Company	2019	https://www.bmwgroup.com/en/company.html
BMW02	BMW Group | Company | History	2019	https://www.bmwgroup.com/en/company/history.html
BMW03	BMW Group | Company | Strategy	2019	https://www.bmwgroup.com/en/company/strategie.html
BMW04	BMW Group | Company | The Next 100 Years | Future Views | Mobility is Becoming Tailor-Made	2019	https://www.bmwgroup.com/en/company/the-next-100-years/futureviews/tailor-made.html
BMW05	BMW Group | Company | The Next 100 Years | Future Views | Mobility is Becoming Versatile	2019	https://www.bmwgroup.com/en/company/the-next-100-years/futureviews/versatile.html
BMW06	BMW Group | Responsibility | Product Responsibility	2019	https://www.bmwgroup.com/en/responsibility/product-responsibility.html
BMW07	BMW Group | Responsibility | Talking to Sustainability Experts	2019	https://www.bmwgroup.com/en/responsibility/talking-to-sustainability-experts.html
BMW08	BMW Group and Daimler AG Invest More Than €1 Billion in Joint Mobility Services Provider	2019	https://www.bmwgroup.com/en/brands-and-services/Mobilitaets-Joint-Ventures-BMW-Group-Daimler-AG.html

BMW09	Get to Know our Mobility Power House	28.02. 2019	https://www.bmwgroup.com/en/company/bmw-group-news/artikel/urban-mobility.html
BMW10	Joined Forces in the Field of Future Mobility	22.02. 2019	https://www.bmwgroup.com/en/company/bmw-group-news/artikel/joined-forces.html
BMW11	BMW Group - Daimler AG Joint Venture Will Take Mobility 'To The Next Level'	19.12. 2018	https://www.bmwgroup.com/en/company/bmw-group-news/artikel/mobility-services.html
BMW12	DriveNow	2019	https://www.drive-now.com/de/en
BMW13	ReachNow	2019	https://www.reachnow.com/
BMW14	Fact Sheet comprising five Joint Ventures	22.02. 2019	https://www.press.bmwgroup.com/global/article/attachment/T0292204EN/425241
BMW15	Press Release: BMW Group and Daimler AG invest more than €1 billion in joint mobility services provider	22.02. 2019	https://www.press.bmwgroup.com/global/article/detail/T0292204EN/bmw-group-and-daimler-ag-invest-more-than-%E2%82%AC1-billion-in-joint-mobility-services-provider
BMW16	Press Release: BMW Group and Daimler AG agree to combine mobility services	28.03. 2018	https://www.press.bmwgroup.com/global/article/detail/T0279654EN/bmw-group-and-daimler-ag-agree-to-combine-mobility-services

9 APPENDIX

Please see the uploaded appendix(s).