

NHH



The Impact of Servitization on Business Model Innovation

*Understanding the transition towards a service-based business
model*

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This thesis was written as a part of the Master of Science in Economics and Business Administration at NHH. Please note that neither the institution nor the examiners are responsible – through the approval of this thesis – for the theories and methods used, or results and conclusions drawn in this work.

Preface

This master thesis is one of a series of papers and reports published by the Center for Service Innovation (CSI). Center for Service Innovation (CSI) is a coordinated effort by NHH to focus on the innovation challenges facing the service sector and involves 15 business and academic partners. It aims to increase the quality, efficiency and commercial success of service innovations and to enhance the innovation capabilities of its business and academic partners. CSI is funded through a significant eight-year grant from the Research Council of Norway and has recently obtained status as a Center for Research-based Innovation (SFI).

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Abstract

This master thesis is an empirical study on how servitization affects the degree of business model innovation. The analysis is based on 284 responses from Chief Executive Officers in a variety of Norwegian industries. Previous literature suggests that servitization is associated with high degrees of business model innovation. Nevertheless, few researchers have studied this relationship, and our findings indicate that servitization surprisingly is associated with low degrees of business model innovation. Furthermore, we find that uncertain competitive environments and high degrees of external pressure accelerate the extent to which servitization results in business model innovation. In contrast, rigid managerial practices hinder the innovation of business models. These findings produce interesting and relevant implications for managers and decision makers, in which we suggest that working towards increased flexibility and adopting a business model perspective on servitization may facilitate the process of innovating the business model.

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Abbreviations

BM – Business Model

BMI – Business Model Innovation

CSI – Center for Service Innovation

R&D – Research and Development

CMV – Common Method Variance

VIF – Variance Inflation Factor

CEO – Chief Executive Officer

1. Introduction

The business model, which is how a company creates, delivers and captures value, is to an increasing extent seen as an important tool to facilitate strategic change processes and create sustained competitive advantage. In recent years, there has been a massive growth in research on business models, and in particular on understanding how business models are adapted or innovated over time. Changing how a company creates, delivers or captures value is most commonly known as business model innovation. The increased popularity in business model innovation seems to accompany the belief that we are now entering the fourth industrial revolution characterized by the unknown potential of new technology, and the evolution of new and disruptive business models (Schwab, 2016).

When the “rules of the game” are changing, many companies might need to redefine the logic of doing business and find new ways to create competitive advantage. Many product-based firms therefore seek to integrate service components into their range of activities and offering to customers. This so-called servitization often reflects a transition from selling products into selling services, in which the customer-relationship changes from being transaction- to relationship-based. Servitization is thus regarded as a fundamental shift in firms’ existing business models (Foss & Saebi, 2017) and seen as one of several emerging trends that are expected to drive the need for business model innovation in the time to come (Saebi, 2016). A transition towards servitization can yield several benefits, such as increased customer loyalty, stability of revenues and, perhaps more importantly in the field of strategy, sustained competitive advantage.

Although existing studies offer guidance on how firms can develop new services, few researchers have adopted a holistic business model perspective on servitization. The result is that literature is particularly sparse when it comes to understanding what a transition towards servitization implies for the process of business model innovation. One central theme in this thesis will therefore be to delve in to the research gap that exists between servitization and business model innovation.

Furthermore, transitioning towards servitization can be challenging for managers and organizations. Both internal and external characteristics of firms and industries can make the

business model rigid and challenging to alter. Since such a transition also involves considerable risk, understanding how drivers and challenges moderate the relationship between servitization and business model innovation will hence be another topic in this thesis.

Building on the aforementioned themes, review of extant literature and the identification of research gaps, the purpose of this thesis will be to address the following research question:

How does servitization affect the scope of business model innovation and to what extent is this relationship moderated by external drivers and internal challenges?

In order to answer this question, we analyzed survey data collected by the Center for Service Innovation at the Norwegian School of Economics. Both servitization and business model innovation are seen as important, and sometimes crucial, tools to create sustained value creation and extend market scope. We would argue that these two concepts are highly complementary, but they nevertheless remain poorly understood and are rarely analyzed in a holistic framework. Highlighting how these concepts are intertwined is therefore highly relevant. The main contributions of this thesis will thus be to better the understanding of how servitization affects the degree of business model innovation, and how organizational and environmental factors influence the degree to which companies manage such a change process.

1.1 Outline of work

The introduction provided a brief presentation of the central topics for this study. The further structure of the thesis will be as follows. In Chapter 2, we conduct a review of literature on the topics of business models, business model innovation and servitization. The aim is to establish an understanding of recent developments, identify key research gaps and illustrate how the fields of servitization and business model innovation converge and diverge. Based on the literature review, we develop hypotheses and a conceptual framework. A description of measurement instruments, data collection techniques and the quality of research is presented in Chapter 3. Chapter 4 outlines how the data was analyzed using a Spearman correlation test, and single and multiple regression models. Discussion, implications, limitations and recommendations for future research are provided in the final chapter.

2. Theoretical Foundation

2.1 The Business Model

The business model has gained increased attention in research and business communities over the last decade. This is visualized by for instance Zott, Amit and Massa (2011), who found at least 1,177 published articles addressing business models in academic journals from 1995 to 2011. Similarly, Foss and Saebi (2017) uncovered 7,391 publications on BMs for the period of 1980-2015 in the Scopus database.

The literature on business models reveals that many scholars have associated business models with the rise of the Internet (e.g. Teece, 2010; Zott et al., 2011) and the emergence of new e-business ventures in which the business model has been employed to understand and classify different enterprises (e.g. Magretta, 2002; Lambert & Davidson, 2013). Other scholars (e.g. Teece, 2010; Kindström & Kowalkowski, 2014) have focused on business models as an important factor contributing to firm performance and competitive advantage in the sense that a well-functioning BM with aligned elements reduces the possibility of imitation (e.g. Doz & Kosonen, 2010; Chesbrough, 2007, 2010). Another research stream has studied business models in the domains of innovation and technology management in which firms commercialize innovative ideas and technologies through their BM or that the BM itself represents a source of innovation (Wirtz, Pistoia, Ullrich & Gottel, 2016; Zott et al., 2011).

The research on business models has, apart from experiencing massive growth, been characterized by a lack of consensus on what the definition of a business model is and what components it consists of (Saebi, Foss & Lien., 2016; Foss & Saebi, 2017; Kindström, 2010). Literature reveals numerous definitions and, to some extent, confusion on what are the components of a BM. For instance, the business model has been referred to as both a *statement*, a *description*, a *representation*, an *architecture*, a *model*, a *structural template*, a *method*, a *framework*, a *pattern* and a *set* giving rise to a multitude of possible interpretations (Zott et al., 2011). Furthermore, both Zott et al. (2011) and Foss and Saebi (2017) assert that many researchers tend to not define business models at all, and out of the definitions that do exist, they only partially overlap.

Although this has been problematic for researchers and business practitioners, more recent studies (cf. Saebi et al., 2016; Teece, 2010; Magretta, 2002; Foss & Saebi, 2017; Kindström, 2010) depict that scholars now are beginning to agree on the components that constitute a business model. In general, most definitions refer to the way value is created, delivered and captured. Several researchers additionally stress that a business model is a holistic and conceptual (cf. Kindström, 2010; Teece 2010; Zott et al., 2011), rather than financial, model and that the complementarity between the components are important (cf. Teece, 2010; Foss & Saebi, 2017; Magretta, 2002; Foss & Stieglitz, 2015; Santos, Spector & Van der Heyden, 2009; Kindström & Kowalkowski, 2014).

For instance, Teece (2010, p. 172) describes the business model as the “design or architecture of the value creation, delivery and capture mechanisms employed”. Osterwalder and Pigneur (2010, p. 14) similarly define the business model as “the rationale for how an organization creates, delivers and captures value”. This definition is accompanied by the framework *Business Model Canvas*, consisting of nine components that outline how the firm goes about creating, delivering and capturing value (Osterwalder & Pigneur, 2010). In the same fashion, Kindström (2010) identifies six components constituting a business model: *Value proposition*, *revenue mechanisms*, *value chain*, *value network*, *competitive strategy* and *target market*.

Saebi et al., (2016, p. 567) do not propose a framework but refer to the business model as “the firm’s value proposition and market segments, the structure of the value chain required for realizing the value proposition, the mechanisms of value capture that the firm deploys, and how these elements are linked together in an architecture”. This is the definition we will adopt throughout this thesis. We argue that although definitions differ in terms of components, they all essentially outline how a company creates and delivers value to customers and turns that value into profits. This opinion is also emphasized by Foss and Saebi (2017), who show that most current definitions are consistent with Teece’s (2010).

2.2 Business Model Innovation

In addition to conceptualizing and explaining what business models are at a given point in time, literature has recently moved towards a more dynamic view by examining how business models are adapted or innovated over time (cf. Achtenhagen, Melin & Naldi, 2013; Wirtz, Schilke & Ullrich, 2010; Saebi et al., 2016; Foss & Saebi, 2017; Doz & Kosonen, 2010; Voelpel, Leibold & Tekie, 2004; Kindström, 2010).

Achtenhagen et al. (2013) argue that business models cannot be static, and that sustained value creation depends on successfully shaping, adapting and renewing the business model on a continuous basis. However, the research on adapting or innovating business models is still novel (Foss & Saebi, 2017) and remains subject to different definitions and interpretations. Following Foss and Saebi (2017), we find that the innovation dimensions of BMs have been studied from a variety of angles. For instance, business model change has been referred to as business model *reinvention* (Voelpel et al., 2004), *renewal* (Doz & Kosonen, 2010), *dynamics* (Achtenhagen et al., 2013), *learning* (Teece, 2010) and *erosion* (McGrath, 2010).

Foss and Saebi (2017) propose that these terms effectively all fall into the category of *business model innovation*, but simultaneously stress that no precise definition of business model innovation has yet emerged. For instance, business model innovation has been defined as “when the company modifies or improves at least one of the value dimensions” (Abdelkafi, Makhotin & Posselt, 2013, p. 13), pointing to somewhat incremental innovation in at least one component of the BM. Other authors, such as Markides (2006, p. 20), highlight more radical changes and define business model innovation as “the discovery of a fundamentally different business model in an existing business”.

Foss and Saebi (2017, p. 201) define business model innovation as the “designed, novel, nontrivial changes to the key elements of a firm’s business model and/or the architecture linking these elements”. This definition is grounded in innovation empirics and complexity theory. Innovation is typically seen as either radical, incremental, modular or architectural (cf. Henderson & Clark, 1990), while complexity theory entails that the BM is viewed as a complex system composed of interdependent subsystems (Foss & Saebi, 2017). Foss and Saebi (2017) thus argue that innovating a BM in which the components are tightly complementary implies architectural change. On the other hand, innovating a BM consisting of more loosely connected

components is associated with modular change (Foss & Saebi, 2017). Building on this perspective they find that research on BMI differs in at least two dimensions.

The first refers to the degree of *novelty* of the BMI. For instance, some authors (e.g. Osterwalder & Pigneur, 2010) highlight BMIs that are new to the firm and not necessarily new to the industry (cf. incremental changes), while others (e.g. Santos et al., 2009) emphasize BMIs that are new to an industry (cf. radical changes) (Foss & Saebi, 2017). Changes that are new to the firm imply that the firm mainly aims to adapt to its external environment, while changes that are new to the industry are associated with more innovative changes in which the firm aims to disrupt existing market or industry conditions (Foss & Saebi, 2017).

The second dimension is related to the *scope* of the BMI and refers to how much the business model is affected by a business model innovation (Foss & Saebi, 2017). Some authors (e.g. Santos et al., 2009; Abdelkafi et al., 2013) suggest that BMI can affect just one component of the BM (Foss & Saebi, 2017). Other scholars (e.g. Markides, 2006) require entirely new combinations of all the BM components and the architecture linking them when referring to BMIs (Foss & Saebi, 2017). Foss and Saebi (2017) highlight that both of these perspectives provide valuable insight and propose a *BMI Typology* depicted in Figure 1, in which they distinguish between four types of BMI.

		Scope	
		<i>Modular</i>	<i>Architectural</i>
Novelty	<i>New to firm</i>	Evolutionary BMI	Adaptive BMI
	<i>New to industry</i>	Focused BMI	Complex BMI

Figure 1: BMI Typology (Foss & Saebi, 2017)

Evolutionary BMI is the idea of continuous changes and improvements in individual components of the BM that often occur naturally over time, while *adaptive* BMI describes changes in the overall BM that are new to the firm, but not necessarily new to the industry (Foss & Saebi, 2017). Adaptive and evolutionary BMIs can thus be non-innovative and are mainly a response to external factors (Saebi et al., 2016).

On the other hand, *focused* and *complex* BMIs refer to cases in which managers actively induce modular or architectural changes to the BM to disrupt market conditions (Foss & Saebi, 2017). Focused BMI is associated with modular change, that is, an innovation within one area of the BM, such as changing the value proposition or targeting a new market segment. A complex BMI is, in contrast, an innovation that affects all BM components (Foss & Saebi, 2017).

In this thesis, we adopt the definition provided by Foss and Saebi (2017) including the BMI typology depicted in Figure 1. This means that business model innovation could occur by (1) introducing new value propositions, (2) targeting new customer segments, (3) finding new ways to develop, produce and deliver value propositions (changes in the value chain) or (4) finding new ways to capture value through new revenue mechanisms. Business model innovation is thus seen as both changes in some or all components of the BM that can be new to the firm or new to the industry.

2.2.1 Drivers of Business Model Innovation

In line with Foss and Saebi (2017), we found few studies that deal directly with theorizing the drivers of BMI. That is, few scholars have systematically linked antecedents with the BMIs they refer to, or empirically tested how different drivers affect the propensity to innovate a business model (Foss & Saebi, 2017). For instance, BMI has been seen as a necessary response to competitive pressure (Doz & Kosonen, 2010) or to the accelerating pace of the business environment (Voelpel et al., 2004), but without explicitly or empirically describing the relationship between these antecedents and BMIs (Foss & Saebi, 2017). Nevertheless, we find that drivers of BMI roughly could be categorized into two streams. The first is often associated with internal drivers, in which firms seek to innovate their business model as a means of disrupting existing market conditions and/or to create sustained value creation, differentiate or avoid traditional competition such as price or capacity wars (see for instance Foss & Saebi, 2017; Aspara, Hietanen & Tikkanen, 2010; Santos et al., 2009; Teece, 2010).

The second is to a greater extent related to a need to change the BM in order to adapt and respond to external events. For instance, various literature (eg. Saebi et al., 2016; Chattopadhyay, Glick & Huber, 2001) illustrate that companies often adapt their business models in response to either perceived threats or perceived opportunities. Threats are defined as “negative situations in which loss is likely and over which one has little control”, and opportunities can be explained as “positive situations in which gain is likely and over which

one has a fair amount of control” (Chattopadhyay et al., 2001, p.939). Saebi et al. (2016) examined business model adaptation in response to external threats and opportunities through *threat-rigidity theory* and *prospect theory*. They found that companies, when faced with perceived threat, are more likely to adapt their business models (Saebi et al., 2016). Perceived opportunities are, in contrast, not as strong incentives in which the company is more likely to uphold their status quo and not adapt their business model (Saebi et al., 2016).

Table 1: Drivers of BMI

Themes	Findings	Authors
Drivers of business model innovation	Adapting to external stakeholders	Ferreira et al. (2013); Miller et al. (2014)
	Adapting to new opportunities as a result of new technology	Wirtz et al. (2010); Sabatier et al. (2012)
	Regulatory and technological forces changing the competitive environments of firms	De Reuver et al. (2009); Voelpel et al. (2004)
	Threats, opportunities and strategic orientation	Saebi et al. (2016); Chattopadhyay et al. (2001)
	Disrupt existing market conditions	Santos et al. (2009); Aspara et al. (2010); Foss and Saebi (2017); Foss and Saebi (2018)

Furthermore, several studies have investigated how firms change their business model to adapt to their external environment. Ferreira, Pronça, Spencer and Cova (2013) found that companies tend to adapt their business models to adjust to the needs of external stakeholders. Miller, McAdam and McAdam (2014) also accentuate this idea and assert that multiple stakeholders continually are part of shaping and developing the business model. Additionally, new developments in information and communication technology have been associated with business model adaptation. Wirtz et al. (2010) investigated how environmental changes affected different e-business models and concluded that firms continuously need to adapt their business models in order to stay competitive. Furthermore, Sabatier, Craig-Kennard and Mangematin (2012) suggest that new business models that challenge established companies could emerge when new technology is introduced to an industry.

A third line has evolved around understanding how changes in the competitive environments of firms drive business model adaptation. For instance, De Reuver, Bouwman and MacInnes (2009) examined the importance of regulatory changes versus market forces as drivers for business model adaptation. They found that technology and market forces were more influential drivers than regulations. Voelpel et al. (2004) furthermore accentuate that disruptive changes in business landscapes have led to the creation of new industries and business models. In order to adapt to these “new” environments and future waves of disruption, they find that firms tend to innovate their business models continuously (Voelpel et al., 2004).

Additionally, Saebi et al. (2016) studied the role of strategic orientation in relation to business model adaptation. The strategic orientation of a firm illustrates what set of actions it believes will lead to superior performance and can be divided into market development orientation (exploring new opportunities) and domain defense (maintaining a position). Saebi et al. (2016) found that firms with a market development orientation are more likely to adapt their business model, whereas firms that emphasize the latter are less likely to introduce changes.

2.2.2 Challenges Associated with Business Model Innovation

In addition to studying the drivers of business models, scholars also highlight the difficulties in driving and managing a business model innovation process. A number of studies (e.g. Achtenhagen et al., 2013; McGrath, 2010; Andries, Debackere & Looy, 2013) emphasize willingness to experience and the ability to develop leadership and organizational capabilities as critical competences needed for innovating a business model. In addition, several authors (e.g. Amit & Zott, 2001; Saebi et al., 2016; Teece, 2010; Chesbrough, 2010) point to business model rigidity or path dependencies as challenges to overcome in a BMI process.

One significant barrier to business model innovation is the need to balance exploitation of a current business model with the exploration of new business opportunities (Chesbrough, 2010; McGrath, 2010; Andries et al., 2013; Cavalcante, 2014). Amit and Zott (2001) argue that business model change often is hindered due to conflicts with existing business models or with the configuration of assets that underlie that model. Chesbrough (2010) similarly suggests that firms need to explore new BMs alongside the execution of their prevailing BM. Several authors (e.g. McGrath, 2010; Andries et al.; 2013; Cavalcante, 2014; Achtenhagen et al., 2013) thus stress that with new business models, experimentation is key.

Table 2: Challenges associated with BMI

Themes	Findings	Authors
Challenges associated with business model innovation	Lack of experimentation capabilities	Achtenhagen et al. (2013); McGrath (2010); Andries et al. (2013); Cavalcante (2014); Chesbrough (2010)
	Leadership and organizational capabilities	Achtenhagen et al. (2013); Doz and Kosonen (2010); Chesbrough (2010); Foss and Stieglitz (2015)
	Different BMIs pose for different managerial and organizational challenges	Foss and Saebi (2018), Foss and Saebi (2017), Foss and Stieglitz (2015)
	Business model rigidity	Amit and Zott (2001); Teece (2010), Chesbrough (2010), Christensen et al. (2016)
	Path-dependency	Saebi et al. (2016)

Another challenge in the domain of business model innovation is related to firms' ability to develop leadership and organizational capabilities that support such innovation processes. Achtenhagen et al. (2013) highlight that, in addition to experimentation, a balanced use of resources and the achievement of coherence between leadership, culture and employee commitment are critical to achieve sustained value creation. Doz and Kosonen (2010) stress that accelerating business model innovation requires a top team that is willing to venture into new models and abandon old ones, highlighting a need for leaders to be flexible and open-minded. Chesbrough (2010) finds that managers often struggle to recognize what the correct business model is or should be, and similarly proposes that leaders need to adopt an experimental mindset towards business model innovation and the exploration of new business opportunities. Foss and Saebi (2018) and Foss and Stieglitz (2015) affirm that top management have a crucial role in contributing to the success of BMI. They, however, note that the involvement of leaders needs to be matched with the chosen BMI approach, because different BMIs represent different management challenges (Foss & Saebi, 2018; Foss & Stieglitz, 2015).

In addition to management capabilities, other organizational factors such as strategic flexibility and agility (Schneider & Spieth, 2013; Chesbrough, 2010; Doz & Kosonen, 2010; Foss & Saebi, 2017) are frequently put forth as critical for supporting BMI. For instance, Chesbrough

(2010) finds that an organizational culture needs to be strong and flexible in order to balance exploitation of current opportunities with exploration of new ones. Similarly, Doz and Kosonen (2010) emphasize the need for flexible organizational cultures in order to fuel BMI.

Christensen, Bartman and Van Bever (2016) assert that business models by their nature are designed not to change and that they become less flexible and more resistant to change as they develop over time. According to Teece (2010), business model change involves a fundamental shift in the paradigm or mindset by which the firm goes to market and asserts that inertia is likely. In a similar fashion, Doz and Kosonen (2010) depict that companies over time naturally evolve towards increased stability, but therefore also rigidity, which may counteract the ability to be flexible for change. Saebi et al. (2016) equivalently accentuate the idea of path-dependency as a problem when it comes to business model change. Path-dependency refers to the continuation of traditional practices even when new and better alternatives emerge. Since business models are connected to a set of interdependent activities and relationships within and between firms and external stakeholders, they can be stable and efficient, but also become rigid and inert over time (Saebi et al., 2016).

2.3 Servitization

Literature on servitization indicates a growing interest in this topic by academia and business communities, which seems to be motivated by a belief that servitization is a means to create additional value (Baines, Lightfoot, Benedettini & Jay, 2009). The first use of the term servitization was by Vandermerwe and Rada (1988: 314) who defined servitization as “the increased offering of fuller market packages or “bundles” of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings”. Baines et al. (2009) show to various other definitions but conclude that most of them agree with the definition provided by Vandermerwe and Rada (1988). We also adopt this definition. Hence, servitization refers to the integration of customer focused service components into the firm’s range of activities, which often reflects a shift from selling products (transaction-based) into selling services (relationship-based) (Baines et al., 2009). Servitization can range from introducing services as an “add-on” to products, to introducing services as the main part of the value creation process (Kindström, 2010; Oliva & Kallerberg, 2003; Gebauer et al., 2008).

2.3.1 Servitization as a Driver for Change

Servitization is regarded as a fundamental shift in firms existing business models and seen as a potential driver of business model innovation (Saebi, 2016). Few researchers have, however, studied how these two concepts truly relate or conceptualized how servitization in fact is a driver of business model innovation (but see Kindström, 2010; Kindström & Kowalkowski, 2014). Literature rather points to servitization as a driver for financial or strategic outcomes that are rarely explained in a business model innovation context.

For instance, several authors (Kindström, 2010; Wise & Baumgartner, 1999; Baines et al., 2009; Sawhney, Balasubramanian & Krishnan, 2004) refer to servitization as driver for financial outcomes such as increased or more stable revenues (Kindström, 2010; Baines et al., 2009) and higher customer loyalty (Oliva & Kallenberg, 2003). Sawhney et al., (2004) found that after a servitization process, revenues stay stable even when product sales decline, because product-service combinations are less sensitive to price-based competition. Services are additionally seen as more counter-cyclical than products and are therefore less likely to be affected by economic booms and busts (Baines et al., 2009).

Table 3: Outcomes associated with servitization

Themes	Findings	Authors
Financial outcomes	Higher customer loyalty Revenue growth Increased stability of revenues	Kindström (2010); Wise and Baumgartner (1999); Baines et al. (2009); Sawhney et al. (2004); Oliva and Kallenberg (2003)
Strategic outcomes	Competitive advantage Differentiation Reduce imitability of BM	Frambach et al. (1997); Chesbrough (2007), Kindström and Kowalkowski (2014); Gebauer et al. (2008); Visnjic Kastalli, Van Looy and Neely (2013)
Sustainability	Extend lifetime of products Reduce resource use	Visnjic Kastalli and Van Looy (2013); Mont (2004); Jørgensen and Pedersen (2018)

Other authors (Oliva & Kallenberg, 2003; Frambach, Wels-Lips & Gündlap, 1997; Chesbrough, 2007; Kindström & Kowalkowski, 2014) refer to servitization as a driver of strategic outcomes and in particular competitive advantage. When competitive environments change and competition in product sectors tightens through for instance price wars and

differentiation, servitization is also perceived as a potential tool to create sustained competitive advantage (Kindström, 2010; Baines et al., 2009; Oliva & Kallenberg, 2003; Chesbrough, 2007; Frambach et al., 1997).

Furthermore, servitization also frequently appears in environmental economics literature as a driver for increased sustainability (Visnjic Kastalli & Van Looy, 2013). Mont (2004) highlights that introducing services prolongs product life and thus reduces product turnover and environmental footprint. Jørgensen and Pedersen (2018) similarly make a case for how stakeholders and regulators will expect companies to become more sustainable and argue that future business models will be characterized by increasing extents of service components and a shift from ownership– to access-based transactions.

2.3.2 Challenges of Servitization

In addition to studying servitization as a driver for organizational change processes, scholars (e.g. Gebauer, Fleisch & Friedli, 2005; Kim, Cohen, Netessine & Veeraraghavan, 2010; Visnjic Kastalli & Van Looy, 2013) have also pointed to a number of challenges for companies whose corporate cultures and organizational structures may stand in the way of servitization.

For instance, several authors (e.g. Bowen, Siehl & Schneider, 1989; Visnjic Kastalli & Van Looy, 2013; Visnjic Kastalli, Van Looy & Neely, 2013) point to a cultural and cognitive bias against servitization such as heterogeneity and flexibility, since these values contradict traditional manufacturing practices such as standardization and efficiency. This bias is present in all levels of the organization but is particularly accentuated when it comes to organizational design and leadership capabilities (see e.g. Slack, 2005; Kindström, 2010; Visnjic Kastalli & Van Looy, 2013; Gebauer et al., 2005; Oliva & Kallenberg, 2003).

A large number of studies (Visnjic Kastalli & Van Looy, 2013; Gebauer et al., 2005; Oliva & Kallenberg, 2003; Baines et al., 2009; Kindström, 2010; Kindström & Kowalkowski, 2014) stress that organizational changes are needed in order to succeed with servitization. Kindström (2010) finds that the success of servitization depends just as much on organizational changes as it does on the creation of particular services. Baines et al. (2009) assert that companies must adapt their organizational structures and processes to allow the company to grow in a service-minded way. Since this is difficult, several authors (Visnjic Kastalli & Van Looy, 2013; Oliva & Kallenberg, 2003; Kindström, 2010) stress that a big challenge for

many firms is a lack of managerial capabilities for leading and reorganizing the firm towards becoming a product-service provider.

Table 4: Challenges of transitioning towards servitization

Themes	Findings	Authors
Organizational structure	Cultural and cognitive bias Inadequate organizational structure	Bowen et al. (1989); Visnjic Kastalli and Van Looy (2013); Slack (2005); Gebauer et al. (2005); Baines et al. (2009)
Leadership capabilities	Managers fail to understand scope of changes and reorganize firm	Oliva and Kallenberg (2003); Kindström and Kowalkowski (2014); Homburg et al. (2003); Kindström (2010)
Implementation issues	Fail to alter revenue mechanisms Revenue decline Fail to appropriate profits	Kim et al. (2010); Gebauer et al. (2005); Bowen et al. (1989); Kindström and Kowalkowski (2014)
Risk	Insecurity in the organization Customized solutions increase complexity and risk	Visnjic Kastalli and Van Looy (2013); Nordin et al. (2011); Storbacka (2011); Baines et al. (2009); Kindström (2010)

Several studies (e.g. Kim et al., 2010; Visnjic Kastalli & Van Looy, 2013; Oliva & Kallenberg, 2003; Kindström, 2010; Kindström & Kowalkowski, 2014) also emphasize how many companies face implementation issues related to servitization. Oliva and Kallenberg (2003) argue that firms often seem to fail in deploying a successful service strategy, and therefore fail with a transition towards a service-based business model. Implementation problems could range from being a result of lack of attention from top management or an inadequate organizational design, to a problem of appropriating the value created in the service business (Gebauer, Krempf, Fleisch & Friedli, 2008; Oliva & Kallenberg, 2003, Bowen et al. 1989).

Last, many authors (Visnjic Kastalli & Van Looy, 2013; Kindström, 2010; Nordin, Kindström, Kowalkowski & Rehme, 2011; Storbacka, 2011) accentuate that servitization represents risk. Baines et al. (2009) argue that this is partly due to the fact that servitization typically positions firms in new competitive environments, which is perceived as risky by management. Servitization is additionally often associated with advanced customer solutions where the firm integrates different competences to create tailored solutions (Storbacka, 2011). Nordin et al. (2011) argue that the more the firm provides customized solutions and services, the greater is the value potential, but also the complexity and risk.

2.3.3 Research Gaps

To summarize, we find that research on servitization mainly explains servitization as a driver of financial or strategic outcomes that are rarely treated in relation to business model innovation. Scholars also identify a number of challenges associated with servitization, but do not explain how these apply to a business model context. We identify a few studies (e.g. Kindström, 2010; Kindström & Kowalkowski, 2014; Visnjic Kastalli & Van Looy, 2013) that discuss servitization and business model innovation, but without conceptualizing or explicitly defining BMI. In line with Foss and Saebi (2017), we would argue that servitization in fact is a driver of business model innovation and that the outcomes associated with servitization are highly aligned with, or equivalent to, business model innovation.

Additionally, both servitization and business model innovation literature highlight how organizational structures and leadership capabilities are critical factors for change. We also find that servitization and business model innovation often are initiated and enhanced under conditions of external pressure or when the firm has a strategic orientation towards market development. Literature does not, however, explicitly outline how these factors affect servitization and business model innovation. Our goal moving forward will therefore be to combine insight from these diverging research fields and explain how servitization is a driver for business model innovation.

2.4 Servitization as a Driver for Business Model Innovation

In this section, we will attempt to combine insight from the fields of servitization and business model innovation to illustrate how these concepts relate. Since business model innovation is defined as changes in the four business model components (cf. Chapter 2.2), the key is therefore to address how servitization could lead to innovations in these elements, and hence result in business model innovation. As point of departure, we thus distinguish between the four business model components that emerge from the definition by Saebi et al. (2016): (1) Value proposition, (2) market segments, (3) value chain and (4) revenue mechanisms.

The value proposition represents the offering to customers that creates value and solves a problem or satisfies needs for a specific customer segment (Kindström, 2010; Saebi et al., 2016; Osterwalder & Pigneur, 2010). It is therefore the reason for why customers choose one

company over another (Osterwalder & Pigneur, 2010). If a company engage in servitization, this is equivalent to extending the offering to customers with new services either as “add-ons” to products or as independent service offerings (Kindström, 2010). It is therefore likely that servitization is undertaken in order to serve other customer needs or solve the same problems as before in a different manner. In line with several authors (e.g. Oliva & Kallenberg, 2003; Kindström, 2010; Johnson & Selnes, 2009) we thus expect that servitization often results in new value propositions and business model innovation.

If servitization results in new value propositions, other business model components may also need to be innovated or realigned. For instance, changes may occur in the market segment component, which refers to whom value is created for and what type of relationship the firm wants to build with their customers (Kindström, 2010; Saebi et al., 2016; Osterwalder & Pigneur, 2010). Oliva and Kallenberg (2003) reveal that servitization often is pursued to either attract new customers or stay relevant in current markets. In addition, several authors (e.g. Baines et al., 2009; Oliva & Kallenberg, 2003; Miller et al., 2014; Johnson & Selnes, 2009; Johne & Storey, 1998) emphasize that servitization often involves a changing customer-relationship, which shifts from being transaction- to relationship-based. It is therefore likely that servitization leads firms to change the relationship to either existing or new customers.

When new value propositions are introduced to new market segments it is also likely that the production and delivery of services require new sets of resources and activities. Servitization may thus also require changes in the value chain, which consists of the company’s internal and external resources, processes and activities (Kindström, 2010; Saebi et al., 2016). First, services need to be designed in a way that matches customers’ expectations, needs and willingness to pay (Slack, 2005; Johnson & Selnes, 2004). This is typically associated with cooperation between interdisciplinary teams and a high degree of customer involvement (Gebauer et al., 2005). Next, servitization may result in new ways to deliver value to customers, in which selling services relies more heavily on personal interaction and requires different techniques and skills than product sales (Kindström, 2010). This indicates that accumulation or acquisition of new, and often external, resources and capabilities may be needed both in design and delivery processes (Miller et al., 2002; Kindström, 2010; Kindström & Kowalkowski, 2014).

For servitization to be economically sustainable, firms must also be able to capture a sufficient share of the value created (Kindström & Kowalkowski, 2014). In order to convert servitized

value propositions into profits, firms may therefore need to innovate their revenue mechanisms (Saebi et al., 2016; Teece, 2010). While product revenues often are based on unit sales, service revenues are typically built on different parameters (Mathieu, 2001), in which firms can introduce new and innovate ways of capturing value (Anderson, Kumar & Narus, 2007; Kindström & Kowalkowski, 2014; Kim, Howard & Netessine, 2007). Several authors (e.g. Gebauer et al., 2008; Oliva & Kallenberg, 2003, Bowen et al. 1989) nevertheless highlight that many firms struggle to appropriate the value created from servitization. In some cases, servitization has even resulted in a performance decline (Visnjic Kastalli & Van Looy, 2013). This could be due to failed attempts to innovate the revenue model and in order to succeed with servitization, firms therefore have to design revenue mechanisms that capture profits (Kindström, 2010; Kindström & Kowalkowski, 2014).

Overall, we hence find that although few studies specifically discuss the relation between servitization and business model innovation, it is nevertheless evident that servitization can result in changes that are equivalent to innovations in the four business model components. Servitization could hence be a driver of business model innovation if it results in changes to the value proposition, market segment, value chain or revenue mechanisms that are novel and non-trivial (cf. Foss and Saebi, 2017).

2.5 Hypotheses

The interest in servitization and business model innovation appears to be accelerating both amongst researchers and business practitioners. The previous chapter identified some links between servitization and business model innovation. However, a clear understanding of these concepts and the relation between them still lacks. In addition, it is unclear whether organizational design, leadership capabilities, strategic orientation and external pressure act as constraints or facilitators when it comes to servitization and business model innovation. As an attempt to fill these gaps, we thus propose five hypotheses.

2.5.1 The Overall Relation between Servitization and Business Model Innovation

The first two hypotheses cover the overall relationship between servitization and business model innovation. The literature review indicated that servitization by nature often represents a shift in the logic of doing business and hence require changes in firms' existing business models (e.g. Visnjic Kastalli & Van Looy, 2013; Kindström & Kowalkowski, 2014; Kindström, 2010). According to Slack (2005), services are often difficult to define, and hence challenging to design, deliver and sell. Saebi (2016) explains that servitization is seen as one of several emerging trends that are expected to drive business model innovation. Nevertheless, there is a lack of research that merges the topics of servitization and business model innovation in a combined framework. Although some studies discuss servitization and a corresponding need for business model change, they do so without building on existing literature and explicitly defining business models or business model innovation. The nature of how servitization is associated with business model innovation hence remain empirically unaddressed.

Based on the discussion in Chapter 2.4, it seems like servitization could involve a need to change several components of a business model, and hence result in business model innovation. First, services are often developed in order to create added value for customers (Visnjic Kastalli & Van Looy, 2013), which may result in a new value proposition. New value propositions might increase value for existing customers or open the door to new market segments (Kindström, 2010). In addition, the nature of the customer-relationship could change as service components are added to the offering (Oliva & Kallenberg, 2003). Furthermore, new value propositions and market segments could induce several changes in the value chain. Developing services might require the establishment of new teams that collaborate on customer insight and

key features needed for designing and realizing the value proposition (Kindström & Kowalkowski, 2014). This may in turn require the development or acquisition of new resources, which can be accumulated in-house, or perhaps more efficiently acquired in the firm's external network (Homburg, Fassnach & Guenther, 2003). Firms also need a way of selling and delivering their services, which could result in new value delivery mechanisms. Last, new ways of delivering value could imply changes in the way value is captured through new revenue models, which can be designed more creatively than for products (Mathieu, 2001). Servitization could thus result in business model innovation through altering some or all BM components.

Given our adopted definition of BMI by Foss and Saebi (2017), we believe business model innovation could occur by altering one (low degree of BMI) or several components (high degree of BMI) of the business model. The changes can be either new to firm or new to industry and thus vary in terms of novelty. The degree of BMI is therefore expected to be high if servitization results in novel and non-trivial changes to the value proposition, the customer segment, the value chain and/or value capture mechanisms. If servitization, on the other hand, results in modular and minor changes to one or more components, we expect to detect lower degrees of business model innovation. We therefore hypothesize the following:

Hypothesis 1a: Servitization is positively related to a high degree of business model innovation.

Hypothesis 1b: Servitization is positively related to a low degree of business model innovation.

2.5.2 Internal Challenges

Throughout the literature review it was evident that many authors highlight several challenges for companies that pursue servitization strategies and seek to innovate their business model. In particular, we found that both servitization and BMI literature identified organizational structures and leadership capabilities as critical facilitators for change. We agree on the importance of these factors but believe they are challenging to alter for firms that pursue servitization, because these firms often experience changes that require a major shift in the logic of doing business. Changing the mindset of an entire organization is difficult, and we therefore expect that many firms might fail in undertaking the necessary changes in organizational design and management practices. This might in turn affect the degree to which servitization results in BMI and we thus expect these factors to moderate the relationship between these two constructs.

Organizational Design

BMI literature frequently highlights how the lack of various organizational capabilities might hinder BMI. For instance, several authors (Schneider & Spieth, 2013; Chesbrough, 2010; Doz & Kosonen, 2010; Foss & Saebi, 2017) stress how organizational structures need to be flexible to succeed with BMI processes. Chesbrough (2010) finds that an organizational culture needs to be strong and flexible in order to balance exploitation of current opportunities with exploration of new ones. Similarly, Doz and Kosonen (2010) emphasize the need for flexible organizational cultures to fuel BMI.

Furthermore, Saebi et al. (2016) found that path-dependency could lead to rigid organizational structures and practices and thus become a barrier for business model innovation, because firms continue with established practices and develop routines that are challenging to alter. Christensen et al. (2016) assert that business models by their nature are designed not to change and that they become less flexible and more resistant to change as they develop over time. Doz and Kosonen (2010) similarly depict that companies over time naturally evolve towards increased stability, but therefore also rigidity, which may counteract the ability to be flexible.

Research thus highlights that several organizational variables could influence BMI, with particular emphasis on the need to be flexible to avoid organizational- and business model rigidity. Nevertheless, Foss and Saebi (2017) find that the role of organizational structure in BMI, and the extent to which organizational design need to be changed in order to support BMI, have almost been neglected (but see Foss & Stieglitz, 2015). This is interesting, and somewhat surprising, given the amount of focus placed on organizational changes in BMI literature.

In contrast, research on servitization (e.g. Kindström, 2010; Gebauer et al., 2005; Oliva & Kallenberg, 2003) illustrates how the success of servitization is highly dependent on organizational changes. For instance, Kindström and Kowalkowski (2014) emphasized that an inadequate organizational structure inhibits servitization, while an appropriate structure facilitates it, pointing to how organizational changes are needed. For instance, the firm might need to organize new and interdisciplinary teams and accumulate competences that are more customer-centric than before (Gebauer et al., 2005; Kindström & Kowalkowski, 2014). This does, however, require a major shift in mindset (Kindström, 2010; Oliva & Kallenberg, 2003; Visnjic Kastalli & Van Looy, 2013; Teece, 2010), which is challenging for managers and employees whom have mainly been focused on product development (cf. cognitive bias). We

thus expect that changes in organizational design might be needed to facilitate servitization and succeed with business model innovation but acknowledge that this is challenging. For instance, although firms can use their business model to take advantage of current product-based opportunities, they may find that their resources and capabilities are insufficient – or even counterproductive – for taking advantage of service-based opportunities (Kindström & Kowalkowski, 2014). The organizational design that underpin the success in product development, might thus become a rigidity and constraint when it comes to servitization. We therefore expect that a lack of changes in organizational design, coined as *organizational rigidity*, will hinder the extent to which servitization results in a high degree of BMI. We thus propose that:

Hypothesis 2: Organizational rigidity will moderate the relationship between servitization and BMI so that the relation is weaker than under a high degree of rigidity than under low degree of rigidity.

Managerial Rigidity

Firms' ability to develop leadership capabilities that support change processes are highlighted as important both in servitization and BMI literature (cf. Visnjic Kastalli & Van Looy, 2013; Oliva & Kallenberg, 2003; Kindström, 2010; Achtenhagen et al., 2013; Doz & Kosonen, 2010; Chesbrough, 2010). For instance, Doz and Kosonen (2010) stress that accelerating business model innovation require a top team that is willing to venture into new models and abandon old ones. Similarly, Chesbrough (2010) emphasizes that leaders need to adopt an experimental mindset towards business model innovation and the exploration of new business opportunities.

Kindström (2010), however, finds that managers often struggle to understand the scope of the strategic changes that are necessary for servitization and business model innovation, and thus lack competency in leading such processes. Furthermore, Gebauer et al. (2005) illustrate that the success of servitization depends on a clear service development process built on extensive knowledge of market conditions and customer needs. Integrating such knowledge would typically require new and interdisciplinary teams (Gebauer et al., 2005), but the task of designing new services is nevertheless often assigned to product developers who have little or no experience with service design (Kindström, 2010). Additionally, Kindström (2010) shows that service design requires increased investments in human resources, and yet firms invest

more in R&D for products than they do for services (Homburg et al., 2003; Kindström, 2010). This may illustrate that managers fail to understand that service development requires new and different resources and capabilities than product development.

Flexibility in management practices is thus repeatedly mentioned as a critical capability and a challenge when managing business model innovation. We therefore expect that a lack of changes in management practices, a term we call *managerial rigidity*, will have a negative impact on the relationship between servitization and BMI. We thus hypothesize the following:

Hypothesis 3: Managerial rigidity will moderate the relationship between servitization and BMI such that the relation is weaker under a high degree of rigidity than under low degree of rigidity.

2.5.3 External Drivers

Servitization is often seen as a response to external changes (cf. Table 3). Similarly, we found that business model innovation often is initiated, and even enhanced, under conditions of external pressure or when a company has a strategic orientation towards market development (cf. Table 1). We thus suggest that servitization is more likely to result in a high degree of BMI if the company has a strategic orientation towards market development and is faced with high degrees of external pressure.

Strategic Orientation

Saebi et al. (2016) found that strategic orientation can affect the firm's willingness and ability to undergo change processes and hence innovate their business model. That is, firms focused on maintaining and defending their position are less likely to innovate their business model (Saebi et al., 2016) and rather tend to focus on competitive pricing and developing a single and cost-efficient technology (Miles, Snow, Meyer & Colemon Jr., 1978). These firms are thus likely to be more focused on the exploitation of their current BM rather than the exploration of new opportunities (Chesbrough, 2010; McGrath, 2010; Andries et al., 2013; Cavalcante, 2014). Kindström and Kowalkowski (2014) argue that several firms that servitize often end up defending their current position because they struggle to shift their mindset towards services and instead focus on how to capitalize on the core product offering.

In contrast, firms with a market development orientation are expected to be more agile and flexible (Saebi et al., 2016). These firms continually look for and exploit new market opportunities and thus develop routines and skills that support them in being adaptable to changes in the external environment (Chattopadhyay, 2001; Saebi et al., 2016). Firms with a market development orientation are thus more likely to develop experimentation skills which is argued to be critical for innovating a business model (Achtenhagen et al., 2013; McGrath, 2010; Andries et al., 2013, Cavalcante, 2014). McGrath (2010) highlights that experimentation can take place both within firms and across industries and may offer a new source of competitive differentiation. The reason is that some firms develop superior experimentation capabilities and therefore build better models faster than competitors (McGrath, 2010). Andries et al. (2013) outline that experimentation implies lower initial growth levels, but better facilitates long-term survival. Another argument is given by Cavalcante (2014), who emphasizes trial-and-error experimentation and learning. He argues that experimentation, which most often occurs in the “pre-stage” of potential business model change, provides managers with a better understanding of when change initiatives affect a business model and when they do not (Cavalcante, 2014).

We therefore expect that firms with a market development orientation will be more open-minded and flexible towards experimenting with new business opportunities, and thus more inclined to innovate their business model as a result of servitization. We hypothesize that:

Hypothesis 4: A strategic orientation towards market development will strengthen, and thus moderate, the relationship between servitization and business model innovation.

External Pressure

Changes in the competitive environments of firms and the need to respond to external pressure were associated with both servitization (cf. Table 3), and the corresponding inclination to innovate an existing business model (cf. Table 1).

First, we found that servitization can be introduced, in addition to pursuing servitization to improve revenues, customer loyalty or market scope, services could also be introduced as a means of responding to external changes or pressure (e.g. Baines et al., 2009; Oliva & Kallenberg, 2003; Kindström, 2010). When competitive environments change, previous

competitive advantages can become obsolete, and introduction of services might lead to new ones (Kindström, 2010). Several authors (e.g. Baines et al., 2009; Oliva & Kallenberg, 2003; Chesbrough, 2007) emphasize that competitive advantage achieved through servitization often is more sustainable. One argument is that services are less visible and more labor dependent than products, and thus more difficult to imitate (Kindström, 2010). Another is that services, as add-ons to products, could enhance the customer value to a point where homogenous products are perceived as customized (Frambach et al., 1997), which in turn increases imitation barriers (Baines et al., 2009). A third argument is that a servitized business model in itself reduces the probability of imitation because competitors struggle to isolate and copy single elements of an integrated and well-functioning business model (Chesbrough, 2007; Kindström & Kowalkowski, 2014). Kindström (2010) proposes that this is due to high degrees of complementarity between the resources and activities that underlie such business models. Chesbrough (2007) also accentuates the idea of complementarity and asserts that a coherent business model that exhibits consistency across elements have greater potential to create long-term competitive advantage.

Similarly, we found that responding to external factors such as changes in the competitive environment (De Reuver et al., 2009; Voelpel et al., 2004), threats (Saebi et al., 2016), opportunities (Wirtz et al., 2010; Sabatier et al., 2012) and demand from external stakeholders (Ferreira et al., 2013; Miller et al., 2014) increased the motivation for- and degree of BMI. Although external factors thus seem to affect the motivation for pursuing servitization and business model innovation, quite few studies have illustrated how external factors moderates the relationship between them. In line with how Saebi et al. (2016) found that perceived threat was a strong incentive for BMI, we expect that companies who pursue servitization and are faced with high degrees of external pressure are more likely to display high degrees of business model innovation. We thus propose the following:

Hypothesis 5: High levels of external pressure will moderate the relationship between servitization and BMI so that the relation is stronger than under low degrees of external pressure.

2.5.4 Conceptual Framework

Based on the hypotheses, a conceptual model can be developed. Figure 2 illustrates a framework for the following analysis. We hypothesize that a transition towards servitization is positively related to either high or low degrees of business model innovation. This overall relationship is covered by Hypotheses 1a and 1b. In this thesis, business model innovation is measured as the overall change in the four business model components. These four components will therefore form the dependent BMI-variable, while servitization will be the independent. Furthermore, we highlight four factors that are believed to moderate this relationship. We expect that organizational and managerial rigidity will hinder the degree of BMI, thus giving rise to Hypotheses 2-3. In contrast, a strategic orientation towards market development and high degrees of external pressure are hypothesized to accelerate business model innovation (Hypotheses 4-5).

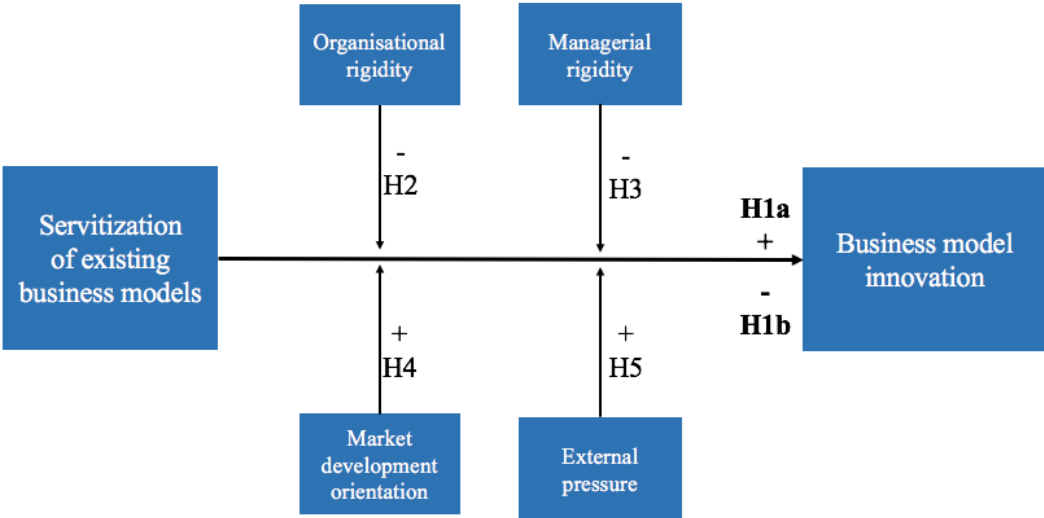


Figure 2: Conceptual model

3. Methodology

Based on the literature review and the proposed hypotheses, the following section will describe the further outline of our thesis. We will first explain the choice of research design and data sampling method that was employed to accept or reject our hypotheses. Next, we will highlight the potential issues that may arise from using these methods through a discussion on the reliability and validity of our research.

3.1 Research Design and Data Sampling Methods

Following the development of a conceptual framework and hypotheses, an appropriate research design and data sampling method were chosen and applied. The overall aim of this thesis was to study the relation between servitization and business model innovation and examine how internal and external moderators affect that relation. The nature of the research question hence corresponded with a descriptive study. Studies can furthermore be conducted by the use of an inductive or a deductive approach (Saunders, Lewis & Thornhill., 2016). Inductive studies typically begin by collecting data before developing a theory, while deductive studies develop a theory before designing a research strategy to test hypotheses. This thesis therefore had a deductive approach, since the starting point was the development of a conceptual framework of hypotheses that was tested based on existing literature.

The chosen design and approach further set the boundaries for what could be considered an appropriate methodology. Given that this study was descriptive, deductive and aimed to uncover relations between servitization and business model innovation, it was suitable to collect quantitative data. This stemmed from two reasons. First, we found that quantitative methods were well-suited when the purpose of the study was to describe, explain or test hypotheses that could be generalized (Saunders et al., 2016). Next, we also found that previous research on the relationship between servitization and business model innovation mostly had been performed through qualitative methods, such as case interviews (see for instance Kindström, 2010; Kindström & Kowalkowski, 2014). This is appropriate when the research aims to explore and gain a deeper understanding of a complex phenomenon. A prominent weakness is, however, that qualitative measures rarely produce proof of relations that can be generalized to larger populations. This study was hence an attempt to fill not only a literature gap, but also an empirical gap.

In order to answer the research question, we analyzed secondary survey-based data collected by the Center of Service Innovation (CSI) at The Norwegian School of Economics. These data covered the topics of interest, and thus fit nicely with the thesis. Potential risks related to using secondary data was that the survey initially could have been collected for a purpose that did not match our research objective, and that we did not have control over neither the data collection process nor the data quality (Saunders et al., 2016). We therefore corresponded with the researchers that sampled the data and received a detailed description of the data collection process and the construction of the survey. This ensured that the dataset was adequate for answering our research question, because it was collected for a purpose highly aligned with ours. Ethical considerations were also undertaken by securing that the dataset consisted of anonymized data in which it was impossible for us to connect responses with the respondents.

The survey was conducted by TNS Gallup on behalf of CSI during the Fall of 2014. The survey was a cross-sectional questionnaire, which means that it studied a particular phenomenon at a particular moment in time (Saunders, et al., 2016). This type of data sampling method is said to be one of the strongest methodical tools when it comes to quantitative research (Saunders et al., 2016), and thus set a solid foundation for our thesis. Furthermore, the questionnaire was an ad-hoc survey, which means that it was conducted by independent researchers and was specific in its subject (Saunders et al., 2016). It measured the topics of business model innovation, servitization and firms' internal and external environments and characteristics.

Moreover, the questionnaire was built on close-ended and opinion-based questions that were a combination between list (yes/no) – and rating questions. The rating questions were measured through the use of 7-point Likert scales to record the degree to which participants agreed or disagreed with proposed statements. These were for instance intended at measuring companies' competitive environment and strategic orientation. Close-ended questions with only yes or no alternatives were asked in order to uncover the scope and novelty of changes in business model components. According to Saunders et al. (2016), the usage of close-ended questions ensures that the data collection is precise, that it generates representative findings, and additionally, that it strengthens the possibility of generalizing the findings to a larger population.

3.1.1 Measurement Instruments

The dataset was unprocessed and consisted of raw data. In order to conduct analyses, we therefore had to compile different sub-questions into variables. The variables were constructed based on the literature review which provided us with the instruments needed to build strong variables that were usable in the further analysis of the hypotheses. Consistency of variables was additionally checked by calculating Cronbach's alpha (Saunders et al., 2016).

Dependent Variable – BMI

Earlier research (e.g. Saebi et al., 2016) shows that the question of how to measure business models and business model innovation has not been thoroughly answered or addressed in literature. Existing measurement scales are therefore still not available. However, recent studies (e.g. Saebi et al., 2016; Clauss, 2016) find that the degree of BMI commonly has been measured as the sum of changes in individual BM components. We therefore intended to do so as well by constructing a variable that measures business model innovation as a function of changes in business model components.

Scope of BMI

In the questionnaire, each section intended at measuring changes in a BM component (for instance the value proposition) consisted of two or three sub-questions. In order to construct variables that measured the overall change in one component, we generated dummy variables, equal to 0 (no changes) or 1 (changes) for every sub-question. Afterwards, we added and scaled the dummies so that each BM variable (i.e. the value proposition, market segments, revenue mechanisms and value chain) illustrated the scope of change, ranging from 0 to 1. Finally, an overall BMI variable was generated by adding the four variables together. The BMI component thus ranged from 0 to 4, where 0 represented no changes in any of the components, while 4 corresponded to considerable changes in all components. Values in between therefore entail either severe changes in few components, or minor changes in several components. Since we, however, were interested in insight about the relation between servitization and business model innovation, we treated business models as an architecture. Whether a value of 2 corresponds to severe changes in two components or minor changes in every component therefore does not matter in this case.

Novelty of BMI

By using the same procedure as above, we created a variable that measured the novelty of changes in business model components. In this case, the variable for each BM component varied from 0 to 2, where 0 = no changes, 1 = changes are new to the firm, and 2 = changes are new to the industry. An overall BMI-variable measuring novelty was also generated, by adding and scaling values of BM components.

Scope and Novelty of BMI

Additionally, we created variables that were supposed to measure both scope and novelty simultaneously. In order to do so, we multiplied dummies that measured scope with dummies measuring novelty. We then added dummies for every component and clustered the firms into five categories: Firms that had not innovated any of the components (=0), firms that had innovated one or two components that were new to the firm (=1, Evolutionary BMI), firms that had innovated one or two components that were new to the industry (=2, Focused BMI), firms that had innovated three or four components that were new to the firm (=3, Adaptive BMI), and firms that had innovated three to four components, in which changes were new to the industry (=4, Complex BMI). To ensure that the above-mentioned variables measured changes in business models in an appropriate and exact manner, we considered their consistency. In these cases, we did not calculate Cronbach's alpha, because this would produce misleading results. Instead, we used the literature review in order to check whether questions examining business model components were consistent with existing literature.

Independent Variables

Servitization

To examine how servitization affects the degree of business model innovation, a variable for servitization was generated. Similar to that of BM components, data on servitization was also collected through four yes/no-questions. In order to construct the variable, each sub-question was thus converted into a dummy variable, before the dummies were added and scaled. The servitization variable hence ranged from 0 to 4, in which 0 was equal to no servitization, while 4 represented a severe degree of servitization. In this case, the consistency was also checked by examining literature and reviewing whether or not the questions in the survey adequately covered the topic of servitization (e.g. Kindström, 2010).

Internal Challenges

Additionally, variables for the internal challenges were constructed. When it comes to managerial rigidity, only one question from the survey was utilized. This question was close-ended, in which respondents were asked whether or not changes to managerial practices had been introduced. The variable was therefore a dummy, and hence took the value of 0 when no changes had occurred, and 1 when changes had been introduced. The organizational rigidity variable was constructed in the same manner. Since each variable was based on a single question, Cronbach's alpha was not possible to calculate, but we ensured that the questions covering managerial and organizational rigidity were consistent with existing literature (e.g. Achtenhagen et al., 2013; Doz & Kosonen, 2010; Chesbrough, 2010).

External Drivers

Five questions from the questionnaire, measured on a 7-point Likert scale, were combined to measure strategic orientation and degree of external pressure. First, a strategic orientation variable was constructed by adding and scaling scores about the importance of customer service, customization, wide product range and innovation. High scores in this variable were thus associated with a strategic orientation towards market development. The variable for external pressure was constructed in similar way, by adding and scaling the scores from sub-questions measuring the intensity of competition, customers' preferences and the severity of technological development in the market that the firm operates in. Hence, increasing variable values were associated with a higher degree of external pressure. To ensure that the constructed variables were sufficiently strong and reliable, they were also evaluated based on existing theory (e.g. Saebi et al., 2016; Miles et al., 1978). Moreover, Cronbach's alpha was calculated and was respectively 0.75 and 0.66 for strategic orientation and external pressure. The variables were therefore consistent and thus good measures of the external drivers (Saunders et al., 2016).

Control Variable

The size of firms was measured as number of employees and seen as an important control variable, because the size of the firm could influence firms' strategic orientation, the complexity associated with organizational design and to what degree the firm innovates their BM. The size of firms produced no significant coefficients in any regression models and therefore had no significant impact on changes in business models. The control variable is hence considered as irrelevant.

3.2 Data Collection

Since we used secondary data to answer our research question, we did not partake in the collection of data. A description of this process is, however, necessary in order to describe the distribution and randomness of respondents, and thus the reliability and validity of the analysis.

3.2.1 Sample

When the aim of a study is to generate valid findings that can be generalized to larger populations, it is crucial to avoid biased observations and obtain a sample that is as large and differentiated as possible (Wooldridge, 2016). In this case, the survey forming our dataset was distributed to over 4,000 CEOs in a variety of Norwegian firms and industries. 284 responded, which is equivalent to a response rate of roughly 7 percent. Although the response rate is quite low, 284 responses are still adequate.

Figure 3 shows the distribution of industries in the sample. The majority of the firms operate in manufacturing, wholesale or the retail trade industry, but several other industries are also represented.

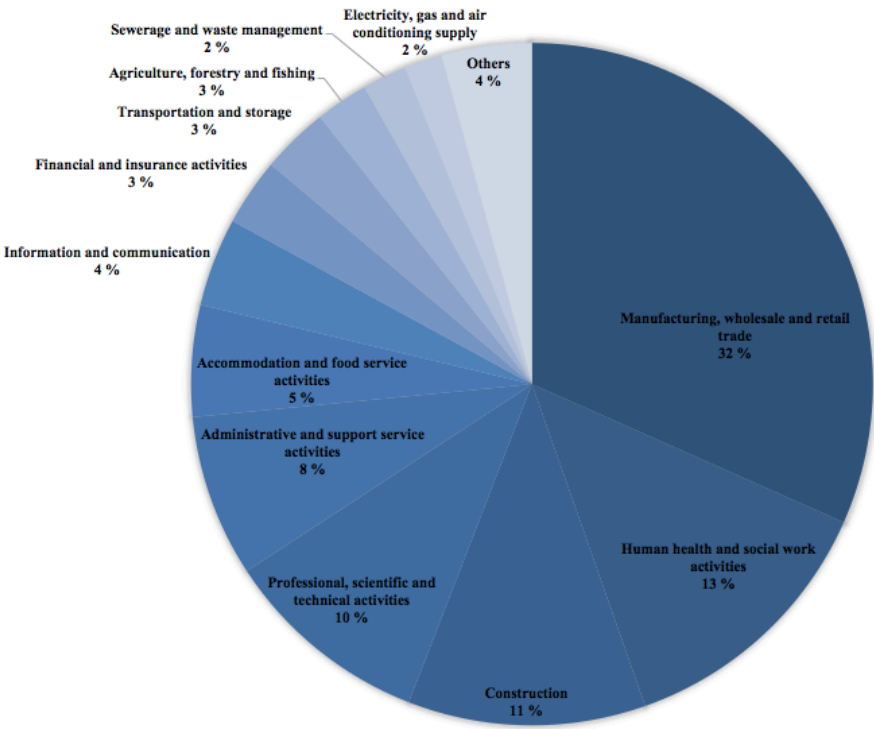


Figure 3: Industries represented in the dataset

Table 5 and Figure 4 illustrate descriptive statistics and distribution of the size of the firms in the dataset, measured as number of employees. Originally, the number of employees varied from 30 to 2318. Since the size of a company in some degree can be associated with their financial and competitive strength, we removed observations of firms that had more than 600 employees, since these were considered to be outliers. According to a report published by Statistics Norway (2018), the majority of the firms in Norway are indeed small or medium in terms of number of employees. Removing observations that deviate substantially in terms of size is therefore beneficial, both for the analysis and for generalizing the results.

After removing outliers, the number of employees varied from 30 to 530, with a mean value of 86, and a standard deviation of 83. Overall, most of the firms had fewer employees than the mean and over 75 percent had less than 100 employees. We thus found that the firms in the sample mainly were small or medium sized.

Table 5: Number of employees

Variable	Number of observations	Mean	Standard deviation	Minimum value	Maximum value
Number of employees	201	86	83	30	530

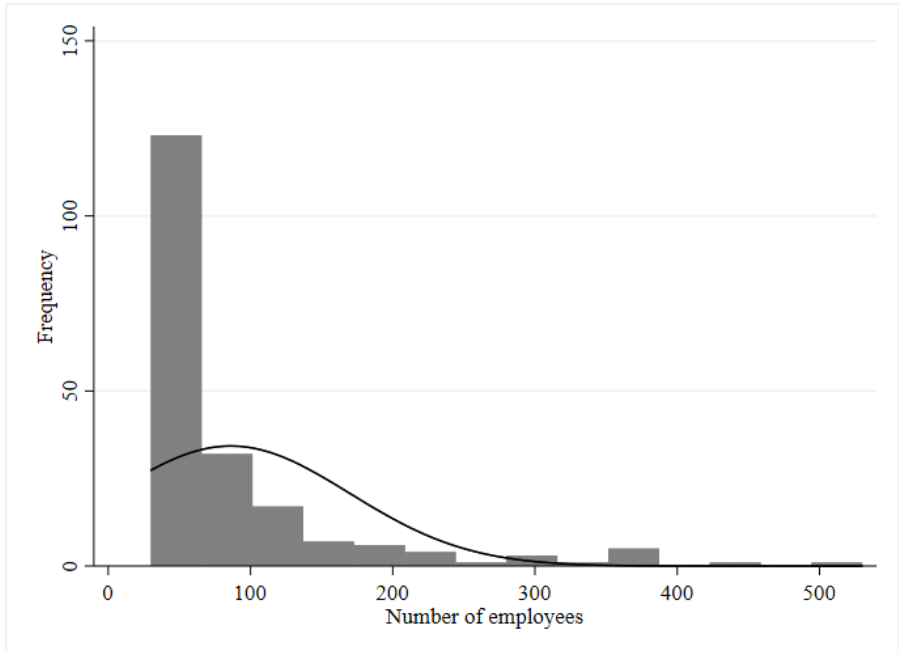


Figure 4: Distribution of firms based on number of employees

3.3 Validity and Reliability

The main goal of scientific studies is to contribute with new, valuable knowledge by presenting and analyzing findings that are credible and dependable (Saunders et al., 2016). In order to ensure that this thesis hence produces findings that are sufficiently credible, this section provides a discussion on reliability and validity.

3.3.1 Reliability

Reliability is the extent to which the data collection techniques and analytical procedures would produce consistent findings if they were repeated on another occasion or replicated by another researcher (Saunders et al., 2016). In this case, reliability is concerned with the robustness of the questionnaire and, in particular, whether or not it would produce consistent findings at different times or under different conditions.

In a questionnaire, it is particularly important to be aware of the fact that although questions are reliable, participants may still interpret them differently, which might result in participant bias or error (Saunders et al., 2016). Such bias can lead to false responses and could be a result of the *social desirability effect*, which means that respondents alter their answers to appear socially acceptable (Kreuter, Presser & Tourangeau, 2008). This is particularly a risk when participants perceive questions as sensitive (Kreuter et al., 2008). Since this questionnaire did not consist of particularly sensitive questions while the participants were ensured anonymity, participant bias should not be a problem. In addition, we were told that the participants could respond to the survey whenever they had the time. This might have removed potential participant error, which is related to factors that affect how participants perform (Saunders et al., 2016).

When it comes to researcher error or bias, there is always a chance of different factors altering the interpretation of responses (Saunders et al., 2016). One such risk is that researchers are more familiar with existing literature than respondents, and thus interpret responses differently from what the respondents mean (Saunders et al., 2016). In order to avoid biased interpretations, we therefore tried to stay as objective as possible throughout the process. In practice, this means that we built the research model before the analysis process, and additionally built variables based on existing theory which ensured that the variables were based on objective criteria. To make sure that the questionnaire itself did not bias the result, common method variance was

additionally calculated. With a score of 29 percent, common method variance was sufficiently low. This therefore indicates that the sampling method was consistent, and that researcher bias appeared to not be an issue.

Since this thesis is a quantitative analysis of servitization and business model innovation, we also went about testing reliability statistically. We thus measured internal consistency, which involves correlating the responses of different questions or parameters (Saunders et al., 2016). There are a number of ways to do this, but one of the most common methods is Cronbach's alpha. Cronbach's alpha was calculated for all the relevant variables and varied from 0.65 to 0.75. According to Saunders et al. (2016), this is equivalent to an internal consistency that varied from moderate to good. We therefore found that the variables were consistent and thus good measures for our further analysis.

3.3.2 Validity

Validity is the extent to which the research measures what it is intended at measuring. Internal validity refers to whether or not the findings of a questionnaire represent the reality of what the study is measuring (Saunders et al., 2016). In a questionnaire, internal validity would thus be established once a set of questions can be shown to be statistically associated with an analytical factor or outcome. This includes content validity and construct validity. Since the questionnaire was built by experts within the fields of business model innovation and based on a careful and thorough definition of previous research, content validity was established. This means that the measurement device, in this case questions and constructed variables, provided sufficient coverage of the topic (Saunders et al., 2016).

Although content validity was established, construct validity still needed to be addressed. This refers to whether or not established measurement scales are sufficient for the collection and analysis of data (Saunders et al., 2016). Given the deductive and descriptive nature of our thesis, we built both hypotheses, construct definitions and measurement scales based on existing literature, which should provide a strong basis for construct clarity. However, the literature review illustrated that the topics we are interested in suffers from a lack of conceptual and definitional clarity. We therefore found no existing measurement scales on the topics of servitization and business model innovation. Since this may represent a threat to construct validity, we attempted to build on the measurement methods of previous research (e.g. Saebi et

al., 2016; Clauss, 2016). Additionally, we calculated Cronbach's alpha and made sure that variables had a highest possible score before conducting further analysis.

Furthermore, external validity should be assessed. External validity refers to whether or not the findings can be generalized to other relevant populations or groups (Saunders et al., 2016). In general, randomly selected and large sample sizes are usually a remedy for external validity since the aim of a sample is that it should represent other relevant populations or situations. In our case, 284 CEOs from a variety of firms and industries in Norway took part in the survey. When it comes to the size of the firms, over 75 percent of the companies had less than 100 employees which corresponds to small or medium sized firms. A report published by Statistics Norway (2018) showed that the majority of firms in Norway are indeed small or medium sized. We therefore claim that the distribution and size of the firms possibly limits the ability to generalize the findings internationally but should produce results that generalize in a national context.

3.3.3 Common Method Variance

Common method variance (CMV) refers to “the amount of spurious covariance shared among variables because of the common method used in collecting data” (Malhotra, Kim & Patil, 2006, p. 1865). It is the variance that occurs in the observations, which is not caused by the constructs, but rather by measurement methods (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). Survey is the data sampling method that is most frequently used in the field of organizational research and also the method that is most exposed to CMV (Podsakoff et al., 2003). Although researchers generally agree that this sampling method potentially can influence the findings, no clear consensus about the seriousness of these effects exists (Malhotra et al, 2006). Since the dataset is built upon self-reporting questions, discussing potential common method variance is critical in order to determine whether our findings are unbiased.

Ex-ante remedies are techniques that are used previous to- and during the data sampling process in order to reduce any potential bias (Podsakoff et al., 2003). Since we did not partake in the data collection process, ex-ante remedies could not be undertaken. It is, however, worth mentioning that certain measures could have been conducted to reduce potential bias. Randomization of the order of question is one of these things. This would, however, not be

possible in this survey, because questions were interlinked and asking them in a random order would therefore not make sense.

The probability of common method variance could additionally be reduced by ensuring anonymity (Saunders et al., 2016). When participants feel safe and know that responses cannot be traced back to them, they are more likely to give honest answers (Kreuter et al., 2008). Also, when participants do not receive credit for their answers, they neither feel the need to impress nor provide answers that are socially acceptable, which could reduce potential social desirability bias and hence CMV (Kreuter et al., 2008). The survey was conducted by TNS Gallup, which is a professional market analysis company who established anonymity and thus lowered the risk of common method variance.

Furthermore, the formulations of questions can influence CMV (Saunders et al., 2016). In this study, all respondents were CEOs. Although the language in the questions might seem technical and academic, it can be expected that CEOs are familiar with this type of formulation. Since all the respondents additionally had the same hierarchical positions, it is likely that they understand the questions in similar ways, which reduces the chances of CMV. Although it may be somewhat presumptuous to claim that CEOs are a homogenous group, it is plausible to perceive the respondents as more homogeneous than a group consisting of employees from all ranks.

Lastly, ex-post remedies, which are statistical ways to deal with common method variance, should be addressed. In order to test whether CMV is present in the dataset, we conducted Harman's one-factor test, which measures the amount of variance each variable is accountable for. The exploratory factor test was conducted in STATA by restraining the model to one factor. The test returned a score of 29 %. Additionally, when we did not constrain the test to one single factor, we obtain three factors with eigenvalues above 1. These three factors cumulatively accounted for 58 percent of the variance in the data, but the largest factor nevertheless explained only 29 percent of the variance. Although we cannot conclusively rule out CMV, Harman's test indicates that CMV does not cause any considerable issues. On the other hand, many researchers have criticized the Harman's test because of its simplicity and inability to correct for a potential method bias (Podsakoff et al., 2003). However, since CMV is not an issue, we conclude that the majority of the variance in the data is explained by the data itself.

4. Analysis and Findings

4.1 Analysis Process

To analyze the data, we used the statistical software package STATA. After uploading the dataset into STATA, variables were constructed in order to conduct analyses. Some of the variables were converted into logarithms, so the interpretation of regressions would be more meaningful. Descriptive and summary statistics were also generated in order to present an overview of the mean, standard deviation, and hence distribution of the constructed variables.

Furthermore, Spearman's Correlation analysis was conducted to examine the superficial relationships between variables. Spearman's Correlation analysis was appropriate since some of the variables were measured through Likert scales. Since such variables are perceived as ordinal levels of measurement, Pearson Correlation analysis, which is used when variables are continuous, was not suitable. (Jamieson, 2004).

In order to study the relationship between servitization and business model innovation, both simple and multiple regressions were conducted using both ordinal, logarithmic and dummy variables. To ensure that the results were unbiased and efficient, all regression models were first checked for linearity. Since none of the variables showed considerable deviations from linearity, we further examined whether the data showed tendencies of multicollinearity or heteroskedasticity.

Multicollinearity is a combined collinearity effect of two or more independent variables that can bias the results in regressions models. Multicollinearity was therefore checked by first examining correlations between variables. Correlation coefficients were constantly lower than 0.9, and therefore not highly correlated. Multicollinearity was additionally examined by calculating the variance inflation factor (VIF). According to Hair, Black, Babin and Anderson (2010), each researcher must determine the degree of collinearity that is acceptable and will not interfere with the results. However, as a rule of thumb, a VIF-value lower than 10 is normally sufficient to claim no multicollinearity (Hair et al., 2010). In our regression models, VIF-values ranged from 1.01 to 1.31. We can therefore conclude that multicollinearity was not an issue and did not bias any of our results.

Moreover, all the multiple regression models were checked for heteroskedasticity, which refers to the state when the variance of the error term ε is not constant (Wooldridge, 2016). In order to obtain efficient estimators, heteroskedasticity should not be present (Hair et al., 2010). To examine whether or not this was the case, we conducted Breusch-Pagan test in STATA. In this test, the null hypothesis states homoskedasticity. For all the multiple regression models, the p-value of the chi-square Breusch-Pagan test ranged from 0.53 to 0.77, which means that the null hypothesis of homoskedasticity could not be rejected. Therefore, we can conclude that heteroskedasticity is not an issue in any of our models, and that our estimators are efficient.

To interpret the regression results, we set a threshold for rejection of null hypotheses. These are rejected when the p-value is lower than 5 percent and when t-statistics lie outside the interval of [-2,2]. Null hypotheses state that beta values in the regressions are equal to zero. Rejection therefore implies that coefficients are significantly different from zero and that the independent variables hence have an impact on the dependent. The null hypothesis tests are two-sided, which imply that moderators can have both positive and negative effects on the relation between servitization and business model innovation.

4.2 Summary Statistics

In order to obtain significant and unbiased results, some observations were omitted from the dataset. First, 38 observations were deleted due to missing or incomplete values. Since we were interested in examining the relation between servitization and business model innovation, we additionally excluded firms that had not introduced new services. 78 observations were therefore omitted, which left us with 208 observations. Moreover, six companies were removed due to the size of the firm.

Cook's distance score was also calculated to scan for multivariate outliers. The threshold for Cook's distance score was in this case set to $4/208$ (number of observations) (Hair et al., 2010). This equals a threshold of approximately 0.019. In our dataset, nine observations were above the threshold. However, eight of these had a score of approximately 0.02, and after closer consideration we found that none of these had extreme values. Therefore, only one extreme observation was removed from the sample, and our further analysis is hence based on 201 observations.

In order to gain general insight on the distribution of the variables, descriptive statistics were calculated. Tables 6 and 7 summarize the descriptive statistics for variables measuring servitization and moderating effects. For each variable, there were 201 observations, which indicates that none of the variables had missing values. This was, however, expected due to the aforementioned removal of outliers.

Table 6: Descriptive statistics of external moderators and servitization

Variable	Variable type	Number of observations	Mean	Standard deviation	Minimum value	Maximum value
External pressure	Likert scale	201	4.05	1.00	1	7
Market development orientation	Likert scale	201	5.10	0.94	1	7
Servitization	Numerous	201	2.91	1.10	1	4

Table 7: Descriptive statistics of internal moderators

Variable	Variable type	Number of observations	Frequency, when =0	Frequency, when =1	Min. value	Max. value
Organizational rigidity	Dummy	201	90 (44.78 %)	111 (55.22 %)	0	1
Managerial rigidity	Dummy	201	91 (45.27 %)	110 (54.73 %)	0	1

The descriptive statistics include mean, standard deviation, frequencies (only for dummy variables), and minimum- and maximum values. These statistics allow us to determine whether or not variables have central tendencies. It is, however, important to note that for the variables that were measured through Likert scale, the mean and standard deviation cannot be interpreted similar to that of continuous variables. This is due to uncertainty when it comes to the centrality and distribution of ordinal variables (Jamieson, 2004). Mean and standard deviation should thus be interpreted with caution, because an increase from 1 to 2 on a Likert scale is not necessarily equivalent to an increase from 3 to 4, and so on. Nevertheless, we present descriptive statistics also for these variables, in order to provide an overview of the variables that are used in the further analysis.

External pressure and servitization showed some tendencies of centrality, since the mean values of the variables were positioned nearly in the middle between the minimum and maximum value. This means that companies, on average, experience a moderate amount of external pressure. Moreover, the mean value of servitization is 2.91, which indicates that firms on average had increased their offerings of services in at least a moderate degree. Furthermore, the variable that captured strategic orientation is positively skewed. This means that the majority of the population have a strategic orientation towards market development. When it comes to organizational- and managerial rigidity, these variables are equally distributed, in which almost half of the population shows tendencies of rigidity.

Table 8: Descriptive statistics of BM component variables

Variable	Number of observations	Mean	Standard deviation	Minimum value	Maximum value
Value proposition	201	0.53	0.44	0	1
Revenue mechanisms	201	0.19	0.32	0	1
Customer segments	201	0.41	0.37	0	1
Value chain	201	0.38	0.32	0	1
BMI	201	1.51	0.98	0	4
Value proposition, novelty	201	0.73	0.70	0	2
Revenue mechanisms, novelty	201	0.22	0.42	0	2
Customer segments, novelty	201	0.51	0.52	0	2
Value chain, novelty	201	0.51	0.50	0	2
BMI, novelty	201	0.50	0.37	0	2

Furthermore, descriptive statistics for business model components are presented in Table 8. These variables range from 0 (no changes) to 1 (severe changes). The variable measuring changes in the value proposition has the highest mean, which indicates that servitization is associated with most changes in the value proposition component. This is intuitive since the introduction of new services often is equivalent to innovating the value proposition. The variables for customer segments and value chain have mean values of 0.38 and 0.41, while revenue mechanisms have the lowest mean of 0.19. This indicates that although firms servitized, they did not necessarily target new customers or innovate their value chain or revenue mechanisms.

Additionally, standard deviations in Table 8 are high, ranging from 0.32 to 0.44, which means that the variance in the sample is high. The overall business model variable, BM, has a mean value of 1.51 and a standard deviation of 0.98. This means that companies, on average, changed one and a half component of their business model. However, since the variance is high, the degree of changes varies considerably among companies. For the BM components measuring novelty, all the mean values are below 1, which implies that out of the firms who introduced changes to their BM components, most of these changes were new to the firm as opposed to new to the industry.

4.3 Hypotheses Testing

4.3.1 Spearman's Correlation Analysis

In order to gain insights for what could be expected in the further analysis, we examined correlations between the different variables. Since some of the variables were measured through a Likert scale (ordinal level of measurement), Spearman's correlation analysis was conducted (Jamieson, 2004). The results are presented in Table 9.

All coefficients measuring correlations between the BMI-variable and the independent variables have p-values that are below the 5 percent threshold, and thus significant. This means that the relation between variables is not random in at least 95 percent of the cases. Servitization, external pressure and market development orientation are positively correlated with BMI, while organizational- and managerial rigidity are negatively correlated with BMI.

Table 9: Spearman's correlation coefficients

	Scope of BMI	Servitization	External pressure	Organizational rigidity	Managerial rigidity	Market development orientation
Scope of BMI	1					
Servitization	0.404***	1				
External pressure	0.263***	0.194**	1			
Organizational rigidity	-0.147*	-0.177*	-0.0412	1		
Managerial rigidity	-0.191**	-0.0893	0.0349	0.447***	1	
Market development orientation	0.356***	0.312***	0.458***	0.000255	0.0184	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Furthermore, servitization is negatively correlated with organizational rigidity, but positively correlated with market development orientation and external pressure. This makes sense in light of our literature review, which illustrated that organizations that are faced with external pressure and focused on market development are more inclined to introduce services and innovate or adapt their BM. The real values of correlation coefficients therefore provide some support for Hypotheses 2-5.

4.3.2. Hypothesis 1

To examine the overall relation between servitization and business model innovation, and thus decide whether Hypothesis 1a or 1b should be accepted, we conducted regression analyses. Results are presented in Table 10.

In the first regression model, the coefficient for the logarithmic servitization variable is equal to 0.796. It is also highly significant ($p=0.1\%$), which means that we, with a 99.9 percent certainty, can reject the null hypothesis stating that the servitization coefficient in model (1) is equal to zero. This indicates that servitization is positively related with business model innovation. However, the coefficient is quite low, indicating that the firms in the sample do not change their business models in the degree they are expected to as a result of servitization (Kindström, 2010; Kindström & Kowalkowski, 2014).

Table 10: Servitization and scope of BMI

	(1) Simple non- linear model: effect on BMI	(2) Simple non- linear model: effect on Value proposition	(3) Simple non- linear model: effect on Revenue mechanisms	(4) Simple non- linear model: effect on Customer segments	(5) Simple non- linear model: effect on Value chain
Servitization, in logs	0.796*** (6.02)	0.297*** (4.91)	0.0749 (1.62)	0.239*** (4.60)	0.184*** (4.04)
Constant	0.740*** (5.17)	0.242*** (3.69)	0.114* (2.28)	0.183** (3.25)	0.201*** (4.09)
<i>N</i>	201	201	201	201	201
<i>R</i> ²	0.154	0.108	0.013	0.096	0.076

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Similarly, regressions (2), (3), (4) and (5) show the results for the effect of servitization on changes in the individual business model components. All coefficients are significant at 0.1 and 1 percent level, except for revenue mechanisms (3), which is not significant at all. This means we keep the null hypothesis stating that the servitization coefficient is equal to zero in model (3). It therefore seems like servitization is not associated with any changes in revenue mechanisms. For the rest of the business model components, coefficients are quite low. The component variables vary from 0 to 1, and the coefficients are respectively 0.297 for value proposition, 0.239 for customer segments and 0.184 for value chain. This means that none of the components change substantially as a result of servitization. The most interesting finding is

the coefficient in model (2), which measures the effect of servitization on the value proposition. Since servitization is equivalent to a change in the services offered by firms, it is peculiar that an increase in servitization does not have a larger impact on the value proposition. Overall, the results therefore show that servitization is positively related with a low degree of business model innovation, and we thus reject Hypothesis 1a and accept Hypothesis 1b.

4.3.3 Hypothesis 2

In Table 11, we present results from the analysis that aim to uncover whether, and in what degree, organizational rigidity modifies the relationship between servitization and business model innovation. Although the servitization coefficient is highly significant in four out of the five models (1), (2), (4) and (5), the coefficient for organizational rigidity is insignificant in all models. This means that we do not have enough support to reject the null hypothesis stating that the coefficient is equal to zero, since the t-statistics are all inside the interval $[-2,2]$. Since a rejection of Hypothesis 2 implies that organizational rigidity modifies the relation between servitization and business model innovation such that the relation is stronger, we conclude that our results do not produce significant results. Since no moderating relations can be detected, Hypothesis 2 is neither accepted nor rejected.

Table 11: Servitization and scope of BMI given organizational rigidity

	(1) Multiple non-linear model: effect on BMI	(2) Multiple non-linear model: effect on Value proposition	(3) Multiple non-linear model: effect on Revenue mechanisms	(4) Multiple non-linear model: effect on Customer segments	(5) Multiple non-linear model: effect on Value chain
Servitization, in logs	0.767*** (5.72)	0.291*** (4.72)	0.0803 (1.70)	0.227*** (4.30)	0.169*** (3.68)
Organizational rigidity, =1 when high	-0.158 (-1.21)	-0.0372 (-0.62)	0.0296 (0.65)	-0.0690 (-1.35)	-0.0815 (-1.83)
Constant	0.855*** (4.99)	0.269*** (3.42)	0.0925 (1.54)	0.233*** (3.46)	0.261*** (4.44)
<i>N</i>	201	201	201	201	201
<i>R</i> ²	0.160	0.110	0.015	0.104	0.091

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.3.4 Hypothesis 3

In Hypothesis 3, we examine whether managerial rigidity moderates the relation between servitization and BMI. Results are presented in Table 12. In this case, only coefficients for the BMI variable (1), customer segments (4) and value chain (5) are significantly different from zero. Managerial rigidity does not influence the relation between servitization and changes in value proposition (2) or revenue mechanisms (3). Coefficients in these models are insignificant, because p-values are larger than 5 percent.

In model (1), the coefficient for servitization is highly significant and equal to 0.765. The managerial rigidity coefficient (-0.303) is significant at 5 percent level. This indicates that a lack of changes in management practices moderates the relation between servitization and business model innovation such that the relation is weaker. This is supported by our literature review, in which firms often do not change their business models when leaders are not inclined to change (Achtenhagen et al., 2013; Doz & Kosonen, 2010; Chesbrough, 2010; Foss & Stieglitz, 2015). We find the same results for customer segments and value chain, in which changes in these components are less likely if management practices are rigid.

Table 12: Servitization and scope of BMI given managerial rigidity

	(1) Multiple non-linear model: effect on BMI	(2) Multiple non-linear model: effect on Value proposition	(3) Multiple non-linear model: effect on Revenue mechanisms	(4) Multiple non-linear model: effect on Customer segments	(5) Multiple non-linear model: effect on Value chain
Servitization, in logs	0.765*** (5.83)	0.300*** (4.91)	0.0674 (1.46)	0.228*** (4.41)	0.170*** (3.81)
Managerial rigidity, =1 when high	-0.303* (-2.38)	0.0225 (0.38)	-0.0744 (-1.66)	-0.111* (-2.21)	-0.140** (-3.23)
Constant	0.936*** (5.72)	0.227** (3.00)	0.162** (2.81)	0.254*** (3.95)	0.292*** (5.24)
<i>N</i>	201	201	201	201	201
<i>R</i> ²	0.177	0.109	0.026	0.118	0.122

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Although the coefficients are significantly different from zero, they are still not considerably large, which indicates that managerial rigidity does not have a strong impact on the degree of changes in business models when companies servitize. Nevertheless, the effect is significant

and present. These findings therefore support Hypothesis 3, and we hence claim that managerial rigidity modifies the relationship between servitization and business model innovation such that the relation is weaker.

4.3.5 Hypothesis 4

Multiple regressions were also utilized to address Hypothesis 4 and the results are presented in Table 13. In this case, we examined whether the degree of market development orientation have an influence on business model innovation when firms introduce new services.

Coefficients for both servitization and market development orientation are significant on at least 5 percent level for BMI (1), value proposition (2), customer segments (4) and value chain (5). This means that we can reject the null hypothesis stating that the coefficients are equal to zero with a 95 percent certainty. Model (3), which examines the effect on the revenue mechanisms, produced insignificant results, which means that market development orientation does not have a significant impact on changes in revenue mechanisms.

Table 13: Servitization and scope of BMI given market development orientation

	(1) Multiple non-linear model: effect on BMI	(2) Multiple non-linear model: effect on Value proposition	(3) Multiple non-linear model: effect on Revenue mechanisms	(4) Multiple non-linear model: effect on Customer segments	(5) Multiple non-linear model: effect on Value chain
Servitization, in logs	0.636*** (4.75)	0.211*** (3.50)	0.0796 (1.63)	0.192*** (3.59)	0.154** (3.25)
Market development orientation, in logs	0.273*** (3.97)	0.148*** (4.76)	-0.00804 (-0.32)	0.0812** (2.95)	0.0524* (2.15)
Constant	-0.500 (-1.46)	-0.429** (-2.79)	0.151 (1.21)	-0.186 (-1.36)	-0.0360 (-0.30)
<i>N</i>	201	201	201	201	201
<i>R</i> ²	0.216	0.200	0.013	0.134	0.097

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The coefficient for BMI is positive, which implies that a higher degree of market development orientation is associated with more changes in business model components. This coefficient is however quite low (0.273), indicating that the effect of market development orientation on business model innovation is only moderate. Additionally, the coefficient for servitization

(0.636) decreases compared to the regressions presented under Hypothesis 1, which means that market development orientation explains some of the variance related to BMI.

Furthermore, the results in models (2), (4) and (5) imply that firms with a high degree of market development orientation implement most changes in their value proposition, customer segments and value chain. These coefficients are also of modest size and are equal to respectively 0.148, 0.0812 and 0.0524. Market development orientation has the largest impact on the component that measures value proposition, which is consistent with our literature review (Saebi et al., 2016). Given the results from the regression models presented in Table 13, we therefore claim that Hypothesis 4 is accepted, although the moderating effect is modest.

4.3.6 Hypothesis 5

In our last hypothesis we address external pressure as a moderating effect. Regression results are presented in Table 14. In this analysis, only models (1) and (2) produce significant coefficients, which indicates that external pressure does not have an impact on changes in revenue mechanisms (3), customer segments (4) and value chain (5). The coefficients for models (1) and (2) are significant at 1 and 0.1 percent level. This indicates strong significance, and therefore a rejection of the null hypothesis stating that external pressure does not have an impact on business model innovation and changes in value proposition.

Table 14: Servitization and scope of BMI given external pressure

	(1) Multiple non-linear model: effect on BMI	(2) Multiple non-linear model: effect on Value proposition	(3) Multiple non-linear model: effect on Revenue mechanisms	(4) Multiple non-linear model: effect on Customer segments	(5) Multiple non-linear model: effect on Value chain
Servitization, in logs	0.725*** (5.48)	0.255*** (4.27)	0.0624 (1.33)	0.235*** (4.44)	0.173*** (3.74)
External pressure, in logs	0.671** (2.86)	0.406*** (3.84)	0.119 (1.43)	0.0381 (0.40)	0.107 (1.31)
Constant	-0.108 (-0.33)	-0.272 (-1.83)	-0.0365 (-0.31)	0.135 (1.02)	0.0659 (0.57)
<i>N</i>	201	201	201	201	201
<i>R</i> ²	0.187	0.170	0.023	0.097	0.084

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The coefficient for external pressure (0.671) in model (1) indicates that an increase in external pressure of 100 percent is associated with changes in business models equivalent to changes in 0.67 components. The coefficient is positive, and relatively high, compared to models presented under Hypotheses 2-4. This indicates that external pressure is one of the stronger moderators in the relation between servitization and BMI. Additionally, the coefficient for external pressure (0.406) in model (2), which examines the effect on the value proposition, is significantly different from zero and larger than the coefficient for servitization. Based on these results, we accept Hypothesis 5, and conclude that external pressure modifies the relation between servitization and business model innovation such that the relation is stronger under a high degree of external pressure.

4.4 Summary of Hypotheses Testing

Overall, we have examined whether our proposed hypotheses can be accepted or rejected by utilizing correlation and regression analyses. The analyses supported most hypotheses, but in the case of organizational rigidity, regressions did not result in significant coefficients in which Hypothesis 2 could not be accepted nor rejected. Table 15 summarizes the findings from the hypotheses testing.

Table 15: Summary of hypotheses

Hypotheses	Spearman's test of correlation	Regression analysis
1a: Servitization is positively related to a high degree of BMI.	Indicated	Rejected
1b: Servitization is positively related to a low degree of BMI.	Indicated	Accepted
2: Organizational rigidity will moderate the relationship between servitization and BMI so that the relation is weaker than under a high degree of rigidity than under low degree of rigidity.	Indicated	Insignificant
3: Managerial rigidity will moderate the relationship between servitization and BMI such that the relation is weaker under a high degree of rigidity than under low degree of rigidity.	Indicated	Accepted
4: A strategic orientation towards market development will strengthen, and thus moderate, the relationship between servitization and business model innovation.	Indicated	Accepted
5: High levels of external pressure will moderate the relationship between servitization and BMI so that the relation is stronger than under low degrees of external pressure.	Indicated	Accepted

4.5 Additional Findings

4.5.1 A Simultaneous Effect of the Moderators

In a real setting, all moderators work simultaneously, and it is therefore advantageous to include them in one model. Table 16 shows the results from multiple regressions including servitization and all four moderators. In this case, external pressure and organizational rigidity coefficients are not significant in model (1), which indicates that when all the moderators are taken into account, these variables do not have a significant influence on the relation between servitization and business model innovation. The impact of external pressure is significant only in models measuring the effect on the value proposition and revenue mechanisms.

Table 16: The overall effect of servitization on the scope of BMI, including moderators

	(1)	(2)	(3)	(4)	(5)
	Multiple non-linear model: effect on BMI	Multiple non-linear model: effect on Value proposition	Multiple non-linear model: effect on Revenue mechanisms	Multiple non-linear model: effect on Customer segments	Multiple non-linear model: effect on Value chain
Servitization, in logs	0.575*** (4.23)	0.189** (3.06)	0.0814 (1.65)	0.175** (3.20)	0.130** (2.73)
External pressure, in logs	0.447 (1.82)	0.260* (2.33)	0.176* (1.97)	-0.0547 (-0.55)	0.0664 (0.77)
Organizational rigidity, in logs	-0.0295 (-0.21)	-0.0582 (-0.92)	0.0854 (1.70)	-0.0318 (-0.57)	-0.0249 (-0.51)
Managerial rigidity, in logs	-0.321* (-2.34)	0.0307 (0.49)	-0.115* (-2.32)	-0.102 (-1.84)	-0.135** (-2.81)
Market development orientation, in logs	1.020** (2.92)	0.553*** (3.49)	-0.157 (-1.24)	0.406** (2.88)	0.219 (1.79)
Constant	-1.109* (-2.13)	-0.883*** (-3.74)	0.137 (0.72)	-0.261 (-1.24)	-0.102 (-0.56)
<i>N</i>	201	201	201	201	201
<i>R</i> ²	0.248	0.221	0.058	0.156	0.148

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

On the other hand, managerial rigidity and market development orientation coefficients are significant on at least 5 percent level and produce interesting results. Compared to the previous

model (cf. Table 13), market development orientation now has a larger impact on the relationship between servitization and BMI, while managerial rigidity has a similar effect as before (cf. Table 12). Overall, we therefore find that some effects are stronger when examining all moderators simultaneously, while others are insignificant.

4.5.2 Complementarity between Business Model Components

Although we accepted Hypothesis 1b, which stated that servitization is positively related to a low degree of business model innovation, it is interesting to examine the complementarity between business model components. Since theory depicted that business models often are perceived as architectural systems, we would expect that the components are complementary, such that changes in one component are associated with changes in another. To examine this assumption, we therefore conducted regression analyses. In these models, each BM component was both a dependent and independent variable.

Table 17: Relation between BM components

	(1) Relation between Value proposition and components	(2) Relation between Revenue mechanisms and components	(3) Relation between Customer segments and components	(4) Relation between Value chain and components
Revenue mechanisms	0.0937 (1.00)		0.192* (2.57)	0.0994 (1.42)
Customer segments	0.394*** (4.73)	0.170* (2.57)		0.248*** (3.91)
Value chain	0.128 (1.35)	0.103 (1.42)	0.290*** (3.91)	
Value proposition		0.0541 (1.00)	0.258*** (4.73)	0.0719 (1.35)
Constant	0.300*** (6.10)	0.0486 (1.20)	0.132** (3.11)	0.220*** (5.96)
<i>N</i>	201	201	201	201
<i>R</i> ²	0.164	0.086	0.249	0.141

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results are presented in Table 17. They indicate that changes in BM components are not highly correlated or complementary to one another. Regression model (1) shows that changes in value proposition only are influenced by changes in customer segments, while coefficients

for the other BM components are insignificant. The only BM component that has an impact on changes in revenue mechanisms is also customer segments (2). Model (3) depicts that customer segments in fact is the only component that is complementary to the other components. The regressions thus illustrate that there are some relations between the four different business model components. These correlations are nevertheless not strong and therefore not perceived as complementary.

4.5.3 Categorizing Types of Business Model Innovation

In this thesis we have so far been examining the relation between servitization and scope of business model innovation. An additional finding we would like to present is whether business model innovation that occur given servitization, represents changes that are new to the firm or new to the industry. To this end, we utilized the variable we created for measuring scope and novelty simultaneously to cluster firms based on the BMI typology proposed by Foss and Saebi (2017). They distinguish between four types of BMIs: Evolutionary, focused, adaptive and complex. In Table 18, we provide the findings from our sample.

Table 18: Distribution of firms in terms of type of BMI

		Scope	
		<i>Modular</i>	<i>Architectural</i>
Novelty	<i>New to firm</i>	Evolutionary BMI N=68	Adaptive BMI N=75
	<i>New to industry</i>	Focused BMI N=21	Complex BMI N=17

It is apparent that most of the companies had introduced some changes to their business models, as there were only 20 firms (10 %) that had not made any changes as a result of servitization. Moreover, 68 firms (34 %) reported to have made changes equivalent to an evolutionary type of BMI, and 75 firms (37 %) had changed their BM in an adaptive nature. Only 21 firms (10 %) made changes equivalent to focused BMI, and even fewer, 17 (9 %) corresponded to complex BMI. These findings show that the majority of the firms in the sample (143 firms, 71 %) made changes to their business model components that are new to the firm, while only 19 % of the companies had innovated their business models in ways that are new to the industry.

5. Discussion

In this thesis, we have presented a model aiming to better the understanding of how servitization affects business model innovation. We also examined the effect of moderating variables that are highlighted as important drivers and challenges for change in both servitization and BMI literature. Our model was thus built on existing literature and attempted to contribute to the research gaps that exist between servitization and business model innovation. We argue that, although typically seen as two separate processes, these concepts are highly complementary and should thus be analyzed in a combined framework. Through such a perspective, we offer theoretical and practical contributions and highlight limitations and research gaps that can be addressed in future research.

5.1 Theoretical Implications

This thesis contributes to addressing theoretical and methodological gaps by producing quantitative findings on topics that previously have been examined separately and almost exclusively through qualitative methods. Moreover, we contribute with insight on the nature of the relationship between the servitization and business model innovation. Our findings suggest that servitization is related to low degrees of BMI. We also find that environmental uncertainty and the degree to which firms adapt to such uncertainty accelerates BMI. In contrast, managerial rigidity hinders the degree of business model innovation.

5.1.1 Methodological Contribution

Most previous research on servitization and business model innovation is based on qualitative measures, and we identified few studies that dealt with these concepts in a combined framework. Following Saebi et al. (2016), we additionally found no validated measurement scale for BMI. By constructing variables that measure BMI through changes in business model components, we hence build on the work of Saebi et al. (2016) and Clauss (2016) and propose a quantitative model for analyzing servitization in a business model framework. One central contribution in this thesis is thus methodological, in which our aim was to contribute to the cumulativeness of BMI research.

5.1.2 Analyzing Servitization in a Business Model Framework

Servitization and Low Degrees of Business Model Innovation

The literature review indicated that servitization often represents new ways of creating, delivering or capturing value, and is associated with complex and architectural business model innovation in which all of the BM components may need to be changed. It is therefore expected that the BM components are highly complementary in which changes in one component induces changes in another (e.g. Kindström, 2010; Kindström & Kowalkowski, 2014).

In our analysis, we nevertheless found that servitization is related to low degrees of BMI. Although it seemed like servitization in some cases had an impact three out of four components of the BM, complementarity between them was not present. This therefore indicates that although many researchers define business models as complex and architectural systems (e.g. Teece, 2010; Kindström, 2010), these linkages were in many cases absent and rather pointed towards modular BMI. In most cases, we also found that the implemented changes were new to firm rather than new to industry. Contrary to theoretical predictions (Kindström, 2010; Kindström & Kowalkowski, 2014), the results thus correspond to evolutionary BMI (cf. BMI Typology).

This may illustrate that the introduction of services is not necessarily a strategy to move from products to services, but rather a strategy to provide added value to existing products or offerings (cf. Kindström, 2010). If this is the case, it is understandable that BM components do not change severely, and likely that the firm has low levels of “service infusion” (Oliva & Kallenberg, 2003; Gebauer et al., 2008; Kindström, 2010).

On the other hand, low levels of BMI and complementarity may also indicate that the complexity of servitization is not realized, and thus not reflected through business model innovation. Existing literature suggests that servitization often requires a need to change several components of a business model, but also illustrates that managers often struggle to comprehend this complexity because servitization involves such a large number of strategic changes (Kindström, 2010; Kindström & Kowalkowski, 2014). Our findings show somewhat similar results, since servitization only is associated with low degrees of business model innovation while managerial rigidity additionally weakens the relationship.

This implies that companies that do not change their management practices, tend to alter their business models at a lesser scale than organizations that have non-rigid management. Our results therefore illustrate that managerial rigidity not only has an impact on whether or not firms portray a high degree of BMI, but also seem to reflect the degree to which business models are rigid.

These findings may therefore indicate that managers do not comprehend, or ignore, the strategic complexity associated with servitization and the complementarity between BM components. It may also imply that it is challenging for firms to alter established routines associated with existing business models. Either way, these pitfalls may result in a failed attempt to reap the potential benefits of a BMI process, such as higher profits and sustained competitive advantage (Kindström, 2010).

External Drivers as Facilitators for BMI

Throughout the thesis, we found that a high degree of external pressure and a strategic orientation towards market development strengthen the relationship between servitization and business model innovation. These findings suggest that firms facing conditions of environmental uncertainty tend to innovate their business models at a larger scale as a result of servitization.

Threats and Opportunities

To a certain extent, our findings support the work done by Saebi et al. (2016), in which they found that perceptions of threat were important drivers for business model adaptation. External pressure can similarly be perceived as a constant presence of threat in the firm's competitive environment. Since threats are defined as "negative situations in which loss is likely and over which one has little control" (Chattopadhyay et al., 2001, p.939), we may expect that firms who experience high degrees of external pressure to a greater extent introduce services as a means of "surviving" or to avoid loss. In such situations, a successful transition towards servitization may be critical for the future of the organization. If this is the case, it is likely that leaders will communicate the importance of changes throughout the organization and hence motivate change. Furthermore, if loss is likely, the firm might also be more inclined to accept high degrees of risk and induce severe changes to their business model.

On the other hand, it is important to note that firms operating in markets where external pressure is continuously high, might also have a strategic orientation towards market development. This means that they develop routines and practices that allow them to respond effectively to such pressure, and thus become more flexible to change (Saebi et al., 2016). When firms have adopted such a flexibility, they may also perceive external pressure as potential opportunities and seek to disrupt existing market conditions or pursue new business opportunities that result in business model innovation. Thus, although Saebi et al. (2016) find that firms are more inclined to change their BM when faced with threats, notions of opportunity could also drive servitization and BMI under conditions of environmental uncertainty.

Path Dependency

Our findings showed that companies with a strategic orientation towards market development display higher degrees of business model innovation as a result of servitization than companies that seek to defend their position. This can be perceived in light of path dependency theory, which refers to the continuation of traditional practices even when new and better alternatives emerge (Saebi et al., 2016; Amit & Zott, 2001; Teece, 2010; Chesbrough, 2010). Domain defense is arguably a continuation of traditional practices, while market development orientation involves breaking out of current routines. Our findings thus suggest that “defenders” are likely to be more rigid and path dependent, and hence implement fewer changes to their business models after introducing new services. In contrast, firms with a market development orientation portray less path dependency and rigidity and implement more changes to their BMs as a result of servitization.

Similar to that of managerial rigidity, the main implication of these findings is that flexibility towards change is particularly important when it comes to servitization and business model innovation. Perhaps this is due to the fact that servitization often occurs in companies that traditionally have been product-centric. These firms may have developed routines that allow them to successfully perform product-centric activities and defend their position over time. Servitization might nevertheless represent a vastly different way of doing business in which it could be challenging to break out of current routines and innovate the business model towards services.

5.2 Practical Implications

The results are also highly relevant for firms and managers who wish to introduce services and succeed in innovating the business model. To address the problem of low degrees of business model innovation and complementarity between components, we propose that managers adopt a business model perspective on servitization. We also suggest that leaders should work towards increased flexibility in management practices and throughout the organization. Finally, we argue that firms should search for new business opportunities even when operating in an industry with low levels of external pressure.

5.2.1 Adopting a Business Model Perspective on Servitization

In order to achieve higher degrees of business model innovation, we propose that managers adopt a business model perspective on servitization. This involves a clear understanding of how the four business model components are structured and interrelated. By viewing the business model as an overarching architecture of the firm's activities, leaders will become better equipped to visualize the complementarity between the components and evaluate to what extent proposed changes require realignment of other elements in the business model. They should thus be able to initiate and manage servitization processes that result in high degrees of business model innovation, in which several or all of the business model components are realigned towards services. This can be done by redefining the value proposition, supplying new customer segments, restructuring the value chain or introducing new mechanisms for capturing value.

Redefining the Value Proposition

In our analysis, the value proposition was the BM component that was most often innovated when firms introduced services. This was in line with theoretical expectations, since introducing new services often implies a change in the offering to customers. The observed changes in value propositions were, however, lower than expected. This might be due to the fact that some firms introduce only minor service components as add-ons to their products, while others introduce changes that completely redefines the logic of doing business. Either way, a clear definition of the value proposition is important because it signals whether or not changes to other components are necessary. If servitization, for instance, represents a radical change to the value proposition, this will signal that the firm could be targeting new customer segments, restructuring their value chain or introducing new revenue mechanisms.

Supplying New Customer Segments

Our results showed that some firms served new customer segments as a result of servitization, and this component was also complementary to the rest of the business model. This supports previous literature predicting that services often are perceived as a source of higher customer loyalty (Oliva & Kallenberg, 2003) and used as a mean to attract new customers (Vandermerwe & Rada, 1988). Managers should therefore evaluate whether or not a new value proposition has the potential of attracting new customer segments or improving the relationship to existing ones. Serving new customers may involve changing the firm's position, which could require new resources and activities throughout the value chain. It may also lead to profit opportunities in which new customers can be introduced to innovated revenue mechanisms.

Restructuring the Value Chain

Our findings illustrated that few firms made changes to their value chain and hence introduced new ways of delivering value. This may implicate that new services are merely add-ons to products, or that companies already produce services, in which servitization only is an extension of their current business. On the other hand, it may also reflect challenges when it comes to designing and delivering services, where changes to the value proposition are not mirrored in changes throughout the value chain. As depicted in the literature review, services are difficult to define and design (Slack, 2005). Managers therefore need to understand and assess which resources and capabilities are needed in order to produce and deliver the value proposition to the chosen customer segment. They should also evaluate whether or not the organization possess or can accumulate the necessary resources. If not, managers should consider acquiring resources in the external network.

Capturing Financial Benefits of Servitization

One of the most interesting findings in this thesis is that revenue mechanisms rarely were altered as a result of servitization. It was also the BM component that undeniably was innovated the least. These findings support several previous studies (e.g. Kim et al., 2010; Visnjic Kastalli & Van Looy, 2013; Oliva & Kallenberg, 2003; Gebauer et al., 2005; Kindström, 2010) that highlight how many companies struggle to capture value from servitization. Since financial outcomes in many cases are expected to drive servitization and BMI, it is somewhat surprising that value capture mechanisms are not innovated to a larger extent. If services are meant to provide a new source of revenue, we believe it is critical to design new revenue mechanisms.

According to Anderson et al. (2007), there are a number of ways to do this, but the key is convincing customers of the value-in-use and the benefits of the new revenue model. Kindström and Kowalkowski (2014) suggest that services often are linked with other services, products or sub-systems that could set the scope for what the firm can charge. Moreover, Kim et al. (2007) propose that firms could communicate with customers in order to agree on acceptable revenue models. No matter what pricing strategy the firm chooses, managers still need to evaluate how new value propositions should be turned into profits.

Managerial and Organizational Capabilities

When it comes to managerial capabilities, it is evident that managers need to work towards increased flexibility. Our findings show that managerial rigidity significantly weakens the relationship between servitization and business model innovation. We believe that managerial rigidity not necessarily is a reflection of an unwillingness to change, but rather a symptom of failing to understand how changes are needed. We suggest that a holistic business model perspective might provide leaders with a better notion of when to intervene, and thus increase their understanding of how different BMIs require different needs for leadership interventions.

Foss and Stieglitz (2015) for instance propose that leaders in evolutionary BMI typically have a monitoring role, while they in complex BMI, “become the architect who is actively involved in everyday experimentation and decision making” (Foss & Stieglitz, 2015, p. 23). Focused BMIs often imply the construction of separate business units that work on innovation, in which managers should become a sponsor of BMI and make sure resources are allocated to the unit and act as a boundary spanner between old and new BMs (Foss & Stieglitz, 2015). Adaptive BMIs are, on the other hand, more demanding for managers who then need to initiate and guide BMI search, while moderating conflicts between different systems and business units (Foss & Stieglitz, 2015). Managers therefore need to consider to what extent servitization should result in different types of BMI (cf. BMI typology, Chapter 2.2), and understand the implications for management practices according to whether or not proposed changes are adaptive or innovative, and modular or architectural.

Moreover, the effect of organizational rigidity was not significant in our analysis. This does not mean, however, that organizational design has no impact on the relation between servitization and business model innovation in reality. It may simply mean that this thesis was unsuccessful

in demonstrating such a relationship. Since a strategic orientation towards market development additionally proves that flexible firms experience higher degrees of business model innovation as a result of servitization, we expect that organizational structures also should be aligned towards greater flexibility. By gaining increased understanding of how business model components are interlinked, we are confident that leaders will have a greater ability to identify and assess organizational changes that are needed to support a BMI process.

External Pressure

Our analysis showed that firms display higher degrees of business model innovation as a result of servitization when they are faced with external pressure. We also found that most BMIs were based on changes that are new to the firm rather than new to the industry. This indicates that although external pressure accelerates business model innovation, changes are still made as a means of adaptation rather than innovation. Most firms therefore introduce services and innovate their business model to adapt to external pressure, whilst few seem to aim at disrupting existing market conditions. We believe that firms, by adopting a business model perspective on servitization, should evaluate whether or not they can explore new opportunities before being “forced” to adapt to external pressure. Exploration at times of prosperity involves less risk and provides a possibility of identifying better and more profitable business opportunities. In such periods, firms might also have better time to assess how new opportunities correspond to changes in business model components. This could result in a more holistic approach, in which we would expect to detect higher degrees of business model innovation and complementarity between components during and after a servitization process.

5.3 Limitations

As for every research project, our thesis has several limitations that future research can address. In this chapter, we will therefore discuss how these limitations restrict our findings and propose how future research can bypass these in order to produce more representative findings.

First, our analysis is based on a dataset that was derived from a cross-sectional question survey. One potential risk related to using secondary data is that it initially could have been collected for the purpose of different research objectives (Saunders et al., 2016). The survey was, however, conducted for a similar research project as ours, and this was therefore not an issue. There are, however, some other potential limitations associated with secondary data. First, we did not construct the survey ourselves, in which we could not control the formulations of the questions. We therefore had no opportunity to work on avoiding participant bias but still managed to build variables that had a solid consistency. We recognize that there are some advantages we miss out on by not constructing a survey specifically designed for our research project, and we therefore propose that future researchers build a survey designed to address the research question directly.

Moreover, the issue of common method variance should be addressed. Because we utilized secondary data, we could not perform ex-ante remedies to avoid bias resulting from the sampling method. We were, however, able to perform ex-post remedies. Single factor Harman's test was conducted, and resulted in a score of 29 percent, well under a 50 percent conventional threshold. This means that we could reject that CMV was a considerable issue. If common method variance, on the other hand, had been present it would have been risky to correct for ex-post. This is because correcting for CMV could have caused bigger problems than CMV caused in the first place (Podsakoff et al., 2003). In future research, we therefore propose that researchers beforehand make sure that common method variance is avoided. This is only possible if researchers develop their own survey, in which they can assure that the variance that is caused by the sampling method is as low as possible. This can for instance be done by randomizing the order of questions, given that it does not cause confusion. Any remedy that can reduce potential bias would contribute to lowering common method variance.

Another limitation of this study is that we could not influence the characteristics of the sample. The survey was distributed to over 4,000 CEOs in a variety of Norwegian firms. Although a sample size of 284 observations is sufficient, a higher response rate would strengthen the

results, in future projects. For instance, some of the relations that appeared to be insignificant, may indeed be significant, but were not discovered due to the sample size. Since the number of respondents is well above a threshold of 100, we nevertheless argue that our results can be generalized to a larger population. Since the sample consisted of only Norwegian firms, the results mainly generalize to a national context. We propose that future research also takes into consideration that a cross-country survey might produce interesting results.

Furthermore, findings are limited due to the interpretation of the definition of servitization. In our sample, the variables that measure servitization do so in a large context. Managers were asked whether or not they had introduced new service offerings during a particular time period. Due to the variety of firms in the sample, servitization could thus reflect both the introduction of minor service components or a transition towards an entirely service-oriented model. Additionally, some firms may already have been fully service-based and did not offer any products at all. In these cases, new service offerings would not be associated with considerable changes for the company and these firms may therefore be a source of negatively biased results when it comes to business model innovation. We acknowledge this issue, but since there were no questions in the survey that determined firms' degree of service offerings prior to servitization, we could not extract this information. We therefore propose that future research should address such control questions in order to determine whether introducing new services indeed could be defined as servitization, or simply is an extension of existing service offerings.

Moreover, the survey was cross-sectional. This means that the phenomena of servitization and business model innovation were only studied at a particular moment in time. When examining development processes such as servitization and BMI, it may take time before changes can be measured. We therefore expect that studying the same firms at different points in time may produce more accurate findings and depict higher degrees of BMI. Since this project was limited in time, it was not possible to conduct a longitudinal study, but we would argue that such a study could strengthen the results and produce interesting insight.

Altogether, this thesis contributes to the cumulativeness of BMI research by building on existing literature and definitions. We nevertheless need to emphasize how the concepts of servitization, business models and business model innovation are still in their infancy and need further conceptualization. If this is achieved, we believe the quality of future research will improve.

6. Conclusion

The overall aim of this thesis was to better the understanding of how servitization affects the degree of business model innovation and to what extent external and internal factors influence this relationship. The results indicate that servitization is associated with low degrees of business model innovation. Contrary to theoretical predictions, we found that servitization mostly induced modular rather than architectural changes to business model components, and that those changes were of an adaptive rather than an innovative nature. We also found that firms that operate in uncertain competitive environments display a higher degree of business model innovation after introducing new services. This might be due to the ability to develop routines and practices that allow them to respond efficiently to external pressure. Firms that, in contrast, introduced new services without changing their management practices experienced lower levels of business model innovation. These findings are relevant for managers, decision makers and entrepreneurs suggesting that flexibility on several organizational levels is critical for successfully innovating a business model as a result of servitization. The results also illustrate the advantage of adopting a business model perspective on servitization, in which managers should evaluate proposed changes along the lines of business model components. Although this thesis contributes to the research on servitization and business model innovation, there is a great potential for future research on these topics. Any future study will contribute to further the conceptualization of the constructs and measurement methods.

7. References

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